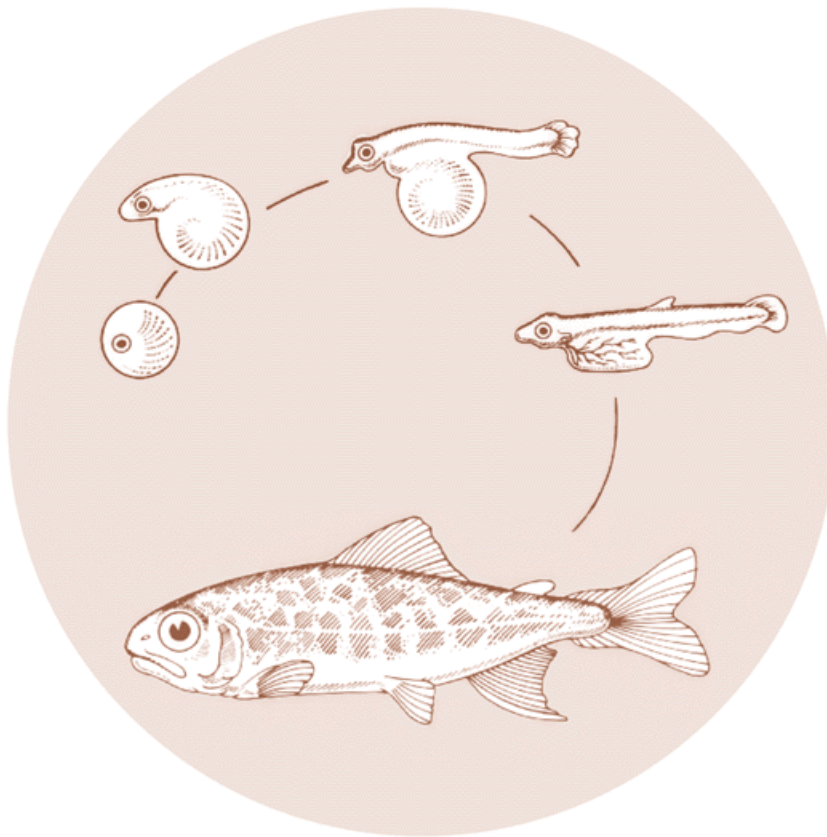


July 1990

# ASSESSMENT OF PRESENT ANADROMOUS FISH PRODUCTION FACILITIES IN THE COLUMBIA RIVER BASIN

Washington Department of Fisheries Hatcheries

Final Report



DOE/BP-98379-4



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Portland, OR 97208-3621

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# ASSESSMENT OF PRESENT ANADROMOUS FISH PRODUCTION FACILITIES IN THE COLUMBIA RIVER BASIN

Washington Department of Fisheries Hatcheries

Final Report

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July 1990

## ABSTRACT

The goal of this report is to document current production practices for hatcheries which rear anadromous fish in the Columbia River Basin and to identify those facilities where production can be increased.

A total of 85 hatchery and satellite facilities operated by the IDFG, ODFW, USFWS, WDF, and WDW were evaluated. The years 1985 to 1987 were used in this evaluation. During those years, releases averaged 143,306,596 smolts weighing 7,693,589 pounds.

A total of 48 hatchery or satellite facilities were identified as having expansion capability. They were estimated to have the potential for increasing production by an 84,448,000 smolts weighing 4,853,306 pounds.

## ACKNOWLEDGMENTS

This project has been a time consuming endeavor that has taken over two years from the initial discussions to complete. It could not have been completed without the cooperation of the various fisheries agencies, tribes, Bonneville Power Administration and others interested in improving the runs of anadromous fish in the Columbia Basin. We wish to thank all who contributed by providing data and/or comments concerning the many drafts. We also wish to recognize the agency personnel who provided the raw data and helpful suggestions that went into this report. They were:

Tom Rogers, Idaho Department of Fish and Game  
Tim Walters, Oregon Department of Fish and Game  
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John Kerwin, Washington Department of Wildlife  
Mark Kimbel, Washington Department of Fisheries

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## INTRODUCTION

The Pacific Northwest Electric Power Planning and Conservation Act, 1980 (16 U.S.C. 839, PL 96-501) passed by Congress, designated for the first time that fish and wildlife resources in the Columbia Basin should receive equitable consideration with power and other water users in resource allocation. The Act called for appointment of a council to guide the regions resource decisions and the resultant Northwest Power Planning Council (NPPC) was formed. The subsequent Fish and Wildlife Program (FWP) was designed to restore anadromous fish resources to previously abundant numbers. The Bonneville Power Administration (BPA), as the federal entity responsible for marketing much of the electrical power produced in the Northwest, is the principle source for funding of the FWP.

The interim goal of the NPPC is a doubling of the anadromous fish run produced in the Columbia Basin. To achieve this goal will require a mix of natural and artificial production. This report is designed to be used in conjunction with sub-basin plans currently being developed by the fishery agencies. In this report, policy and management personnel are being provided with sufficient information to allow informed decisions with regard to artificial production.

To aid in the implementation of the FWP, the NPPC set up Technical Work Groups (TWG) for coordinating and recommending fisheries research. The Hatchery Effectiveness TWG included a hatchery capacity evaluation as a high priority in their five year research plan. This resulted in BPA funding this hatchery capacity evaluation entitled "Assess Present Anadromous Fish Production Facilities in the Columbia River Basin."

In addition to documenting current production practices, the goal of this evaluation is to identify hatcheries where production can be increased by one of the following methods; increase funding only, provision of additional water to existing facilities, or provision of additional pond space and/or water. Implementation of the last two also assume there is room for expansion, the potential for developing additional water supplies is good, and adequate operation and maintenance funding are available. This information is required to effectively evaluate options for expansion of existing hatcheries or construction of new ones which can easily cost 20 to 30 million dollars each.

This anadromous hatchery capacity evaluation was designed to summarize information and data which the fishery agencies were already collecting and had readily available. The evaluation was not designed to fill gaps in existing information or to create a multiple year study. Information gathered in a previous report to BPA titled "Survey of Artificial Production of Anadromous Salmonids in the Columbia River Basin" was utilized where applicable (Washington 1985).

The 1985 to 1987 juvenile release years were chosen for evaluation

in this report. These years were chosen because 1987 was the last year data had been finalized by each agency when this process began and three complete years of information were required. Only data on public facilities have been summarized. No information is included for private facilities such as Sea Resources in Washington or Clatsop Economic Development Commission in Oregon.

The National Marine Fisheries Service (NMFS), Environmental and Technical Services Division, in Portland, Oregon, volunteered to coordinate this evaluation and provide the final report. State and federal fishery agencies responsible for operating anadromous fish hatcheries in the basin supplied the data and reviewed this report for accuracy.

The operating agencies should be contacted to obtain additional information on hatchery operations not provided in this report. Appendix "A" provides addresses and phone numbers for each agency. The following agencies operate anadromous hatcheries in the Columbia Basin and supplied data:

1. Idaho Department of Fish and Game (IDFG)
2. Oregon Department of Fish and Wildlife (ODFW)
3. United States Fish and Wildlife Service (USFWS)
4. Washington Department of Fisheries (WDF)
5. Washington Department of Wildlife (WDW)

The 5 agencies operated a total of 85 hatcheries and satellite facilities devoted to rearing anadromous fish (Table 1). Hatcheries are described as facilities operated year round while satellites are only operated part of the year and are managed by personnel from a parent hatchery. These facilities are located in the states of Oregon, Washington, and Idaho (Tables 2 to 6). Releases from these hatcheries averaged 143,306,596 smolts weighing 7,693,589 pounds during the three years evaluated (Table 7).

Table 1. Number Of Hatcheries And Satellite Facilities Rearing Anadromous Fish In The Columbia Basin And Included In This Evaluation, By Agency.

Agency	Number	Location
IDFG	9	Idaho, Oregon
ODFW	29	Oregon
USFWS	14	Oregon, Washington, Idaho
WDF	16	Washington
WDW	17	Washington
Total	85	



Table 2. Anadromous Fish Hatcheries And Juvenile Satellite Facilities Included In This Evaluation Operated By The Idaho Department Of Fish And Game In The Columbia River Basin.

Hatchery	Location In Columbia Basin	Closest Town
Magic Valley	Snake River Basin	Filer, Id
McCall	Snake River Basin	McCall, Id
Niagara Springs	Snake River Basin	Wendell, Id
Oxbow	Snake River Basin	Oxbow Dam, Or.
Pahsimeroi	Snake River Basin	Ellis, Id
Powell Satellite *	Snake River Basin	Elk City, Id
Red River Pond *	Snake River Basin	
Rapid River	Snake River Basin	Riggins, Id
Sawtooth	Snake River Basin	Stanley, Id

\* Will be operated as satellite facilities to the Clear-water Hatchery when it is completed in 1992.

Table 3. Anadromous Fish Hatcheries And Juvenile Satellite Facilities Included In This Evaluation Operated By The Oregon Department Of Fish And Wildlife In The Columbia River Basin.

Hatchery	Location In Columbia Basin	Closest Town
Big Creek	Below Bonneville Dam	Astoria, Or.
Bonneville	Below Bonneville Dam	Cascade Locks, Or.
Gnat Creek	Below Bonneville Dam	Clatskanie, Or.
Trojan Ponds *	Below Bonneville Dam	Clatskanie, Or.
Klaskanine	Below Bonneville Dam	Astoria, Or.
Sandy	Below Bonneville Dam	Sandy, Or.
Clackamas	Willamette Basin	Estacada, Or.
Leaburg	Willamette Basin	Leaburg, Or.
Marion Forks	Willamette Basin	Idanha, Or.
McKenzie River	Willamette Basin	Springfield, Or.
Roaring River	Willamette Basin	Albany, Or.
South Santiam	Willamette Basin	Sweet Home, Or.
Aumsville Ponds *	Willamette Basin	Aumsville, Or.
Stayton Pond	Willamette Basin	Stayton, Or.
Willamette	Willamette Basin	Oakridge, Or.
Dexter Pond *	Willamette Basin	Lowell, Or.
Cascade	Bon. Dam to Snake River	Cascade Locks, Or.
Irrigon	Bon. Dam to Snake River	Irrigon, Or.
Oak Springs	Bon. Dam to Snake River	Maupin, Or.
Oxbow	Bon. Dam to Snake River	Cascade Locks, Or.
Herman Cr. Ponds *	Bon. Dam to Snake River	Cascade Locks, Or.
Wahkenna Pond *	Below Bonneville Dam	Cascade Locks, Or.
Round Butte	Bon. Dam to Snake River	Madras, Or.
Pelton Ladder	Bon. Dam to Snake River	Madras, Or.
Lookingglass	Snake River Basin	Palmer Junction, Or.
Imnaha Pond	Snake River Basin	Imnaha, Or.

Table 3. Continued

Hatchery	Location In Columbia Basin	Closest Town
Wallowa	Snake River Basin	Enterprise, Or
Big Canyon Ponds *	Snake River Basin	Minam, Or.
Little Sheep Cr Pd*	Snake River Basin	Imnaha, Or.

\* Operated as Satellite Facilities

Table 4. Anadromous Fish Hatcheries And Juvenile Satellite Facilities Included In This Evaluation Operated By The U.S. Fish And Wildlife Service In The Columbia River Basin.

Hatchery	Location In Columbia Basin	Closest Town
Abernathy SCTC	Below Bonneville Dam	Longview, Wa.
Eagle Creek NFH	Willamette Basin	Estacada, Or.
Carson NFH	Bon. Dam to Snake River	Carson, Wa.
Little White Sal.	Bon. Dam to Snake River	Cook, Wa.
Willard NFH	Bon. Dam to Snake River	Cook, Wa.
Spring Creek	Bon. Dam to Snake River	Underwood, Wa.
Big White Pond *	Bon. Dam to Snake River	Underwood, Wa.
Warm Springs NFH	Bon. Dam to Snake River	Warm Springs, Or.
Entiat NFH	Col. Basin above Snake R.	Entiat, Wa.
Leavenworth NFH	Col. Basin above Snake R.	Leavenworth, Wa.
Winthrop NFH	Col. Basin above Snake R.	Winthrop, Wa.
Dworshak NFH	Snake River Basin	Ahsahka, Id.
Kooskia NFH	Snake River Basin	Kooskia, Id.
Hagerman NFH	Snake River Basin	Hagerman, Id.

\* Operated as a Satellite Facility

Table 5. Anadromous Fish Hatcheries And Juvenile Satellite Facilities Included In This Evaluation Operated By The Washington Department of Fisheries In The Columbia River Basin.

Hatchery	Location In Columbia Basin	Closest Town
Cowlitz Salmon	Below Bonneville Dam	Salkum, Wa.
Elokomin	Below Bonneville Dam	Cathlamet, Wa.
Grays River	Below Bonneville Dam	Grays River, Wa.
Weyco Pond *	Below Bonneville Dam	Grays River, Wa.
Kalama Falls	Below Bonneville Dam	Kalama, Wa.
Lower Kalama	Below Bonneville Dam	Kalama, Wa.
Lewis River	Below Bonneville Dam	Woodland, Wa.
Speelyai	Below Bonneville Dam	Ariel, Wa.
Toutle	Below Bonneville Dam	Toutle, Wa.
Washougal	Below Bonneville Dam	Washougal, Wa.
Klickitat	Bon. Dam to Snake River	Glenwood, Wa.
Priest Rapids	Col. Basin above Snake R.	Mattawa, Wa.
Ringold Salmon Pond	Col. Basin above Snake R.	Mesa, Wa.
Rocky Reach	Col. Basin above Snake R.	E. Wenatchee, Wa.
Wells Salmon	Col. Basin above Snake R.	Pateros, Wa.
Lyons Ferry Salmon	Snake River Basin	Lyons Ferry, Wa.

\* Operated as a Satellite Facility

Table 6. Anadromous Fish Hatcheries And Juvenile Satellite Facilities Included In This Evaluation Operated By The Washington Department Of Wildlife In The Columbia River Basin.

Hatchery	Location In Columbia Basin	Closest Town
Beaver Creek	Below Bonneville Dam	Cathlamet, Wa.
Cowlitz Trout	Below Bonneville Dam	Winlock, Wa.
Gobar Pond	Below Bonneville Dam	Kalama, Wa.
Skamania	Below Bonneville Dam	Washougal, Wa.
Vancouver	Below Bonneville Dam	Vancouver, Wa.
Chelan PUD	Col. Basin above Snake R.	Chelan Falls, Wa.
Naches	Col. Basin above Snake R.	Naches, Wa.
Nelson Springs *	Col. Basin above Snake R.	Naches, Wa.
Ringold Trout Pond	Col. Basin above Snake R.	Mesa, Wa.
Turtle Rock	Col. Basin above Snake R.	E. Wenatchee, Wa.
Wells Trout	Col. Basin above Snake R.	Pateros, Wa.
Yakima Trout	Col. Basin above Snake R.	Yakima, Wa.
Lyons Ferry Trout	Snake River Basin	Lyons Ferry, Wa.
Cottonwood Pond *	Snake River Basin	Asotin, Wa.
Tucannon Hatchery *	Snake River Basin	Pomeroy, Wa.
Curl Lake *	Snake River Basin	Pomeroy, Wa.
Dayton Pond *	Snake River Basin	Dayton, Wa.

\* Operated as Satellite Facilities

**Table 7. Summary Of Smolt Releases Made From Hatcheries Rearing Anadromous Fish In The Columbia River Basin.**

Agency	1985		1986		1987		3 Year Average	
	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Number	Pounds
IDFG	6,068,894	462,324	5,863,152	507,768	8,562,600	728,210	6,831,549	566,101
ODFW	36,566,439	2,211,795	42,703,334	2,202,552	46,593,424	2,350,680	41,954,399	2,255,009
USFWS	21,153,938	1,409,515	35,422,782	1,974,484	30,632,436	1,960,689	29,069,719	1,781,563
WDF	53,938,979	2,197,389	66,098,677	2,464,092	63,171,986	2,283,541	61,069,881	2,315,007
VDW	4,167,312	707,050	4,286,585	723,524	4,689,249	897,153	4,381,049	775,909
	.....		.....		.....		.....	
TOTAL	121,895,562	6,988,073	154,374,530	7,872,420	153,649,695	8,220,273	143,306,596	7,693,589

The objectives of this report are to identify production constraints and expansion capabilities at existing hatcheries. It is expected that management and policy personnel for the fishery agencies, tribes, BPA, and NPPC will utilize this document in their planning process to meet the goal of doubling the run of anadromous fish into the Columbia River Basin.

### Data Collection Forms

Information used in this report was compiled in data collection forms completed by the operating agencies. The summary tables in the individual agency sections summarize data submitted on the collection forms. Blank copies of the data collection forms are presented in the appendix.

The data collection forms were divided into 3 parts as follows:

Part I. Existing Capacity: Includes basic information for all public hatcheries rearing anadromous fish within the Columbia Basin. It includes location, water supply, physical layout, staffing, operation costs, production numbers, adult returns, and production constraints. It also includes the agency production goal for each facility. Data collection forms 1.1 to 1.9 are included in this section.

Form 1.1, Hatchery Summary: This form identifies the hatchery or satellite facility, funding agency, initial year of operation, facility and operational synopsis, etc.

Form 1.2, Site Data: This form identifies hatchery location, legal covenants and conditions, and water rights held.

Form 1.3, Water Supply Summary: This form identifies water sources used in the hatchery for fish culture. It identifies the high, low, and average flow and temperature of water available for use that the delivery system is capable of supplying. If hatchery has water re-use system it is described.

Form 1.4, Facility Inventory: Lists rearing units at the hatchery by incubation, starter tanks, raceways, and **ponds**. It includes pond dimensions, volume, age, condition, etc. . A schematic drawing of the hatchery is also attached.

Form 1.5, Staffing Summary: Lists staffing needed to operate hatchery.

Form 1.6, Adult Capturing/Handling: Completed if adults are captured and spawned. This form relates to form 1.7. One copy of this form should be provided for each form 1.7 that identifies releases from eggs taken. Brood year information provided in this form corresponds to egg take and release year data in form 1.7. As an example, yearling spring chinook released in spring 1985 (form 1.7) would have a corresponding



form 1.6 for brood year 1983 since this brood year led to the release. Egg take information on form 1.7 would also be for brood year 1983.

Form 1.7, Hatchery Production: Identifies releases for years 1985 to 1987. A separate form is required for each year. Egg take information corresponds to brood year for fish released. This form relates to form 1.6.

Form 1.8a Hatchery Production Summary for Fiscal Years 1985 to 1987: Summarizes release information from form 1.7 and also identifies interim production. Interim production is identified as fish reared for a period of time and transferred to other stations. The other stations receive credit for these fish when released. No attempt has been made to track transferred fish. A separate form for each year is provided.

Form 1.8b, Hatchery Production Summary For Fiscal Years 1985 to 1987. Summarizes releases and transfers to obtain total hatchery production. Also identifies operating cost by fiscal year. A separate form is provided for each of the three production years.

Form 1.9, Production Constraints: Identifies factors which may be limiting production or affecting smolt quality. Also identifies problems and areas needing upgrading, rehabilitation, or replacement.

Part II. Theoretical Capacity: Theoretical capacity for each facility included in Part I is calculated using flow and density methodologies described in Piper et al (1982) and is identified in form 2.1. The following formulas were used:

Flow Method:  $W = F \times I \times L$       Density Method:  $W = D \times V \times L$

w = Weight of fish in pounds  
F = Flow Index  
L = Length of fish in inches  
I = Water inflow in gallons per minute  
D = Density Index  
V = Volume of rearing unit in cubic feet

The flow index was taken from the table on page 69 of Piper (1982) and varies depending on water temperature and elevation. The density index was assigned by agreement of all agencies prior to compiling the information. The remaining variables are easily obtained from hatchery records. Different density indices were used for raceway type rearing units and large ponds. The definition of a large pond was left up to the individual agencies but is basically large ponds having poor flow patterns and long turnover rates. It should be kept in mind that no one or two

density indices can be expected to fit all the various rearing facilities currently in use. The density indices assigned to each species are shown in Table 8.

Table 8. Density Indices Assigned To Each Species Used To Calculate Theoretical Production Based On Density.

Species	Raceways/Small ponds	Large Ponds
Fall Chinook	.3	.03
Coho	.3	.03
Spring Chinook	.25	.03
Steelhead	.25	.03

Part III. Expansion Capability: Includes an estimate of expansion capability at existing facilities. The basis for expansion and the relevant information are detailed in form 3.1. Costs are not included in this report because in most cases they are little more than guesses. In most cases additional engineering studies are required before accurate costs can be determined.

## INDIVIDUAL HATCHERY REPORTS

The main body of this report consists of detailed information for each hatchery and is divided into individual agency sections. Each hatchery discussion is divided into 4 parts; Introduction, Current Production Constraints, Theoretical Production, and Hatchery Expansion Capability. Each part is described briefly below.

### Introduction

Includes a brief description of hatchery location, rearing facilities, operations, and water rights.

### Current Production Constraints

Contains information identifying areas constraining production in the existing facilities. It also identifies general problem areas which are affecting smolt quality, adult survival, egg take, etc.

### Theoretical Production

This section calculates 2 theoretical capacity levels, one based on flow and one based on density. A brief comparison is made between these two calculations, average production for the 3 years evaluated, and the agency production goal. Throughout the report theoretical capacity and theoretical production are used interchangeably.

Determining the theoretical capacity of a facility is a difficult and elusive concept. There is no single theoretical capacity figure as it will vary each time the species or size at release goal changes. Since size of fish in inches is a variable in the theoretical formulas, by simply changing the species reared or size at release will change the hatcheries theoretical capacity by 50% to 100%. As an example, changing production from fall chinook (3.5 to 4 inch smolts) to coho, steelhead, or spring chinook (5.5 to 8 inch smolts) can double the theoretical capacity in pounds of a facility.

No single set of criteria can be applicable to all hatcheries when attempting to determine theoretical calculations. The formulas used cannot account for the large number of physical and chemical variables which differ from hatchery to hatchery. In addition, recent research has shown that reduced densities may in fact produce as many or more adults over higher densities at least with some species and stocks. While theoretical calculations may provide you with a number which can be physically held and reared, it may or may not have any bearing on increasing adult survival or producing more adults, which is the ultimate goal. As such, production based on theoretical calculations is probably more

applicable to commercial trout producers or catchable trout programs where survival of juveniles in the wild to adults is not a factor.

Theoretical calculations can provide a production starting point with a new hatchery, but actual capacity must be adjusted as the agency gains experience with the facility and adult returns are analyzed.

The theoretical calculations in this report have only been used as a gross comparison to determine if rearing space is in balance with water supply. In cases where the result of the 2 theoretical calculations differ by a large amount, the assumption is made that one or the other (water supply or rearing space) is the limiting factor in production potential. As an example, if the flow method identifies 100,000 pounds can be produced and the density method shows 300,000 pounds it would indicate that additional production may be possible if additional water could be provided. It does not mean that 200,000 pounds more could be produced given additional water. The numbers generated by these 2 formulas are not meant to be absolute and are not to be used as identifying or quantifying what an anadromous hatchery can successfully produce.

#### Hatchery Expansion Capability

This section identifies the land area, potential water supplies, and provides estimates of possible production increases. Each hatchery operated by the individual agencies is discussed in it's respective section. Tables are provided in each agency section which identifies the facilities with the most potential for production increases. The operating agencies were responsible for determining which hatcheries have expansion capability.

The ODFW is currently conducting research into the potential applications of providing an oxygen supplementation system in a hatchery. It will be several years before results from this research provides needed information. If oxygen supplementation is proven effective there may be additional expansion capability which has not been identified in this report.

At several hatcheries, WDF is proposing small scale experimental net pen rearing near the mouths of tributary streams. This experimental net pen rearing has been identified as potential expansion capability in this report. If net pen rearing is proven successful there may be additional expansion capability which has not been identified in this report.

The four constraints identified in this report are defined as follows:

Budget: Identifies those facilities where production is set by budget level. If additional funding could be provided, then production could be increased with existing rearing

space and flows.

Flow: Identifies those facilities where production could be increased by providing additional water to existing rearing ponds. The likelihood that additional water can be found is good.

Rearing Space: Identifies those facilities where production could be increased by providing additional rearing ponds. Space for expansion is available and existing water supply will support additional rearing ponds.

Flow and Rearing Space: Identifies those facilities where production could be increased by providing additional water and rearing ponds. These facilities have space for expansion and a high probability of adequate water supplies to operate them. It also includes those facilities needing major renovation or complete rebuild to more efficiently utilize available water supplies.

The increased production identified in this report should be used as only a general indication of expansion capability. In many cases numbers provided are very preliminary and are based on various assumptions. In most cases, additional detailed evaluation is required for those facilities identified as having expansion potential. Only those facilities deemed by policy and management personnel as capable of meeting future production goals based on hatchery location and species which can be reared should receive additional evaluation. This phase 2 study should include engineering, feasibility study, and estimated cost. An updated estimate of the potential production increase should also be provided based on this phase 2 study.

Hatchery expansion capability has been identified as 84,448,000 smolts weighing 4,853,306 pounds from existing hatcheries or satellite facilities (Table 9). These facilities are located throughout the Columbia Basin and as described above require a wide range of actions to accomplish. It is left up to policy and management personnel to determine which facilities can best meet future goals.

Table 9. Hatchery Expansion Capability For Each Agency Operating Anadromous Fish Hatcheries In The Columbia River Basin.

Agency	Number of Facilities	Production Numbers *	Increases Pounds *
IDFG	4	7,000,000	359,500
ODFW	9	<b>9,492,000</b>	662,583
USFWS	10	<b>12,930,000</b>	546,755
WDF	14	<b>46,865,000</b>	<b>1,923,135</b>
WDW	11	<b>8,161,000</b>	<b>1,361,333</b>
Total	48	<b>84,448,000</b>	<b>4,853,306</b>

\* Numbers and pounds of fish used are those recommended by operating agencies. Numbers and pounds will change if species and/or size of smolts is changed.

## Washington Department of Fisheries

A total of 16 hatcheries or satellite facilities operated by WDF were evaluated. Table 10 and Figure 1 shows the approximate location in the Columbia Basin for each one. The hatcheries are scattered throughout the Columbia Basin but the majority are located in the lower section below Bonneville Dam. These facilities released an average of 61,069,881 smolts weighing 2,315,007 pounds during this evaluation. Fingerling releases increased that to 2,516,906 pounds.

Table 10. Location Of Hatcheries And Satellite Facilities Operated By Washington Department Of Fisheries Which Rear Anadromous Fish In The Columbia River Basin.

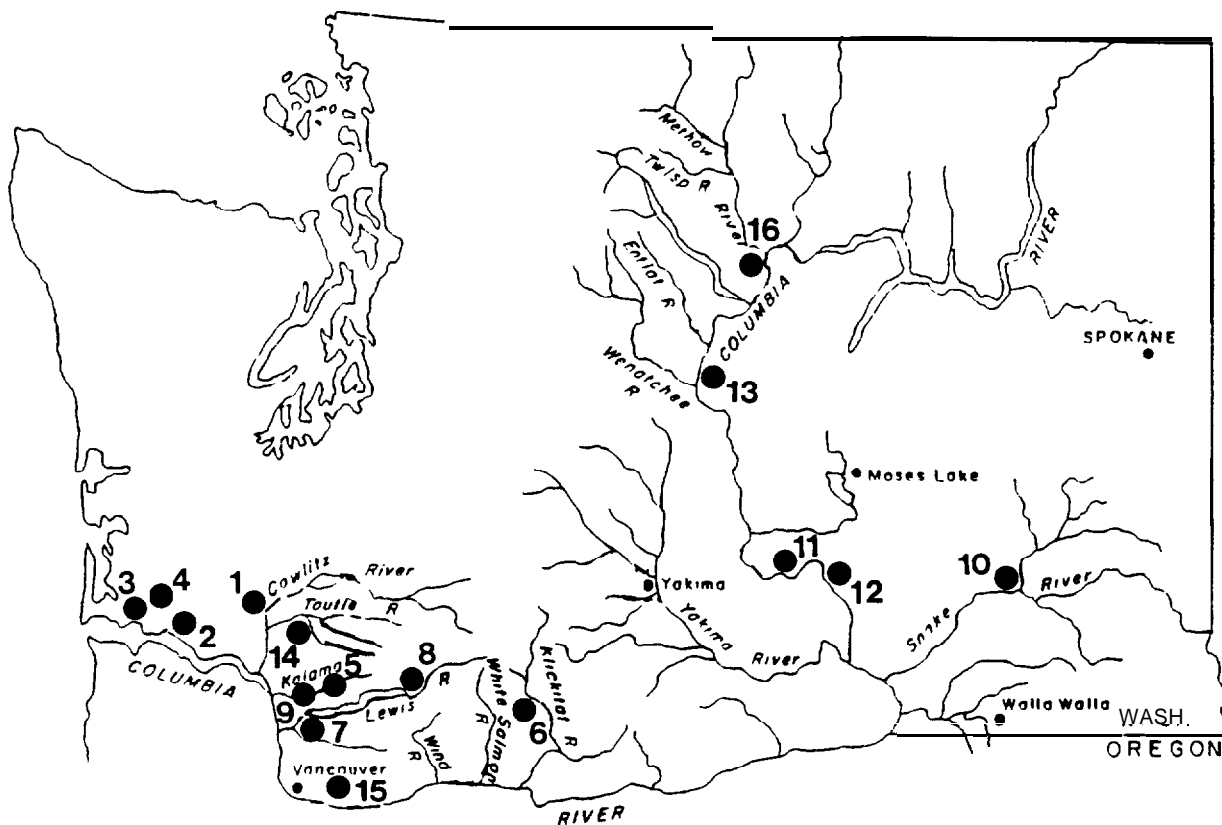
Below Bon. Dam	Bon. Dam to Snake River	Col. Basin Above Snake R.*	Snake River Basin
1. Cowlitz Salmon	1. Klickitat	1. Priest Rapids	1. Lyons Ferry
2. Elokomin		2. Ringold Salmon	
3. Grays River		3. Rocky Reach	
4. Weyco Pond		4. Wells Salmon	
5. Kalama Falls			
6. Lower Kalama			
7. Lewis River			
8. Speelyai			
9. Toutle			
10. Washougal			

\* The new Eastbank Hatchery was not included in this evaluation

Fourteen facilities have been identified where production could be increased (Tables 11 and 12). The potential increase in production at these facilities is estimated to be 46,865,000 smolts weighing 1,923,135 pounds. Most of this expansion capability is located below Bonneville Dam, but over 500,000 pounds is located above that point. To obtain more detailed information refer to individual hatchery discussions.

Two facilities have the potential to increase production rapidly. They are Priest Rapids Hatchery and Weyco Pond. Production at Priest Rapids Hatchery is currently set by mitigation agreement and budget constraints and could rear additional fish given adequate funding levels. Weyco Pond on the Grays River is currently not being utilized.

Figure 1. Approximate Location Of Hatcheries Operated By The Washington Department Of Fisheries Which Rear Anadromous Fish In the Columbia River Basin.



- |                            |                                 |
|----------------------------|---------------------------------|
| 1. Cowlitz Salmon Hatchery | 9. Lower Kalama Hatchery        |
| 2. Elokommin Hatchery      | 10. Lyons Ferry Salmon Hatchery |
| 3. Grays River Hatchery    | 11. Priest Rapids Hatchery      |
| 4. Weyco Pond              | 12. Ringold Springs Salmon Pond |
| 5. Kalama Falls Hatchery   | 13. Rocky Reach Hatchery        |
| 6. Klickitat Hatchery      | 14. Toutle Hatchery             |
| 7. Lewis River Hatchery    | 15. Washougal Hatchery          |
| 8. Speelyai Hatchery       | 16. Wells Salmon Hatchery       |



Table 11. List Of Hatcheries And Satellite Facilities Operated By The Washington Department Of Fisheries Where Production Could Be Increased By Providing Additional Budget, Flow, Rearing Space, Or Flow And Rearing Space.

Budget	Flow	Rearing Space	Flow and Rearing Space
1. Priest Rapids	1. Elokomin	1. Klickitat*	1. Cowlitz
2. Weyco Pond	2. Kalama Falls	2. Speelyai	2. Lewis River
	3. Klickitat*		3. Lower Kalama
	4. Wells,		4. Ringold
	5. Washougal		5. Toutle
	6. Grays River		6. Priest Rapids
			7. Grays River

\* Hatcheries may appear in more than one column.

**Table 12. Expansion Capabilities For Hatcheries Operated By The Washington Department Of Fisheries Which Rear Anadromous Fish In The Columbia Basin.**

Hatchery	Additional Water Available at Site Volume Temp. Range Source	Delivery Method	Land Available	Potential Numbers	Production Pounds	Species
Cowlitz Salmon	large volume	Cowlitz River	Pump	Yes	6,000,000	400,000 Coho
Cowlitz Salmon	large volume	Cowlitz River	Pump	Yes	1,500,000	150,000 Spr. Chinook
Elokoni	12 cfs	Elokoni River	Gravity	Yes	1,500,000	18,750 Fall Chinook
Elokoni		Elokoni River	Gravity	Net Pens	100,000	6,667 Coho
Grays River	10-20 cfs	Grays River	Gravity	No	1,000,000	12,500 Fall Chinook
Grays River	"	Grays River		Net Pens	100,000	6,667 Coho
Kalama Falls	30 cfs	Ronback Springs	Gravity	Yes	1,000,000	100,000 Spr. Chinook
Kalama Falls	Large volume	Kalama River	Pump/Gravi	Rehab hat	3,740,000	46,800 Fall Chinook
Kalama Falls	Large volume	Kalama River	Pump/Gravi	Rehab hat	1,000,000	66,667 Coho
Klickitat	Existing supply	Existing Spring	Gravity	Yes	1,000,000	12,500 Fall Chinook
Lewis River	Large volume	E. F. Lewis Riv.	Pump	Yes	1,800,000	180,000 Spr. Chinook
Lewis River	Large volume	E. F. Lewis Riv.	Pump	Yes	2,000,000	133,334 Coho
Lower Kalama	Large volume	Kalama River	Pump	Yes	600,000	40,000 Coho
Priest Rapids	Large volume	Columbia River	Gravity	Yes	10,000,000	200,000 Fall Chinook
Priest Rapids		Existing supply		Yes	3,125,000	62,500 Fall Chinook
Ringold Salmon	> 60 cfs	Springs/Cot. Riv	Grav/Pump	Yes	1,700,000	212,500 Spr. Chinook
Speelyai	Large volume	Lake		Net Pens	100,000	6,667 Coho
Toutle	Existing right	Green River	Gravity	Rebuild	3,000,000	37,500 Fall Chinook
Toutle	Existing right	Green River	Gravity	Hatchery	1,400,000	93,000 Coho
Toutle	Existing right	Beaver Slough Pd	Gravity	Yes	500,000	33,333 Spr Chin/Coho
Washougal	Large volume	Washougal River	Pump	No	500,000	33,333 Coho
Washougal	Large volume	Washougal River		Net Pens	100,000	6,667 Spr Chin/Coho
Wells	Large volume	Cot. Riv/Re-use	Gravity	Yes	1,600,000	20,000 Summer Chin.
Weyco Pond	Existing supply	Needs Funding	Gravity	No	3,500,000	43,750 Fall Chinook
				TOTAL	46,865,000	1,923,135

Cowlitz Salmon Hatchery  
2284 Spencer Road  
Salkum, Wa 98582

Manager: Paul Peterson  
Phone #: (206) 985-2655

Funding Agency: Tacoma City Light

Species Reared: Fall Chinook  
Spring Chinook  
Coho

## Introduction

Cowlitz Salmon Hatchery is located 8 miles from Mossyrock on the Cowlitz River at river mile 45. Elevation of the facility is 250 feet above sea level. This hatchery was built in 1967 is owned and funded by Tacoma City Light as mitigation for Mossyrock and Mayfield Dams. The mitigation goal is set at 17,300 spring chinook adults, 8,300 fall chinook adults, and 25,500 coho adults. The hatchery is staffed with 13.83 FTE's.

Cowlitz is a large hatchery with ladder, adult return separation facility, 36 modified Burrows ponds (5 for adults/31 for rearing), hatchery building, maintenance facilities, etc. All facilities are in good condition.

Adults are collected and separated on site. Sufficient eggs are taken of each species reared in most years. The hatchery has a capacity to incubate 35 million eggs per year. Sufficient eggs are usually taken to supply other hatcheries.

Adult fall chinook return from mid-August until November with juveniles reared at a final rearing density of 4 to 5 pounds per gpm. Smolts are normally released on-site from May through June and in the fall.

Adult spring chinook return from mid-April through July with juveniles reared at a final density of 8 pounds per gpm. Smolts are released in the spring, normally on-site.

Adult coho return from mid-September to February with juveniles reared at a final density of 15 pounds per gpm. Smolts are normally released on-site in May and June.

All species have ongoing disease problems with Costia so. and bacterial kidney disease (BKD). Other diseases occurring in fall chinook are bacterial gill disease (BGD), bacterial hemorrhagic septicemia (BHS), and furunculosis. Cases of cold water disease, Tricophera sp. and Epistylis sp. have also been reported in coho.

Water rights are held by Tacoma City Light and total 89,766 gpm, (200 cfs) from the Cowlitz River and 4,920 gpm from wells. The hatchery is supplied from 3 sources, all pumped. The majority of water is supplied from the Cowlitz River with an average 68,800 gpm available. The 3 river intake pumps are designed to provide 75,000 gpm but measured flow fluctuates between 63,000 and 71,000 gpm.

The remaining 2 sources are C-wells (1,000 gpm) and PW-wells (800 gpm). The wells are only used between September and March, normally for egg incubation and early fry rearing but on occasion is used for temperature control by mixing with river water in the ponds. Several of the PW-wells produce poor quality water and are not used. Development of additional well water has been attempted in the past, but has not been successful. All rearing units receive single pass water.

### Current Production Constraints

Water and pond space appear to be in balance. There is some excess river water which could be utilized.

Pond splitting young of the year fish is a problem when smolts are still on station. A couple half acre release ponds for spring chinook and coho would help reduce loading/splitting problems.

### Theoretical Production

Theoretical production based on the flow method is 658,864 pounds and with density is 686,430 pounds. Average production was 636,842 pounds and the 1987 agency goal was 477,691 pounds. The current agency goal is 443,600 pounds. Theoretical calculations were computed as follows:

#### Flow Method

Spring Chinook:	1.98 X 2,000 gpm X 6.92" X 12 ponds=	328,838 lbs
Fall Chinook:	1.98 X 2,000 gpm X 3.46 X 9 ponds=	123,314 lbs
Coho:	1.98 X 2,000 gpm X 5.22 X 10 ponds=	<u>206,712 lbs</u>
		658,864 lbs

#### Density Method

Spring Chinook:	.25 X 15,000 cu ft X 6.92" X 12 ponds=	311,400 lbs
Fall Chinook:	.3 X 15,000 cu ft X 3.46 X 9 ponds =	140,130 lbs
Coho:	.3 X 15,000 cu ft X 5.22 X 10 ponds=	<u>234,900 lbs</u>
		686,430 lbs

Comparison of the 2 theoretical calculations indicates that flow and pond space appear to be in balance. The average production for the 3 years looked at is not much less than theoretical poundages.

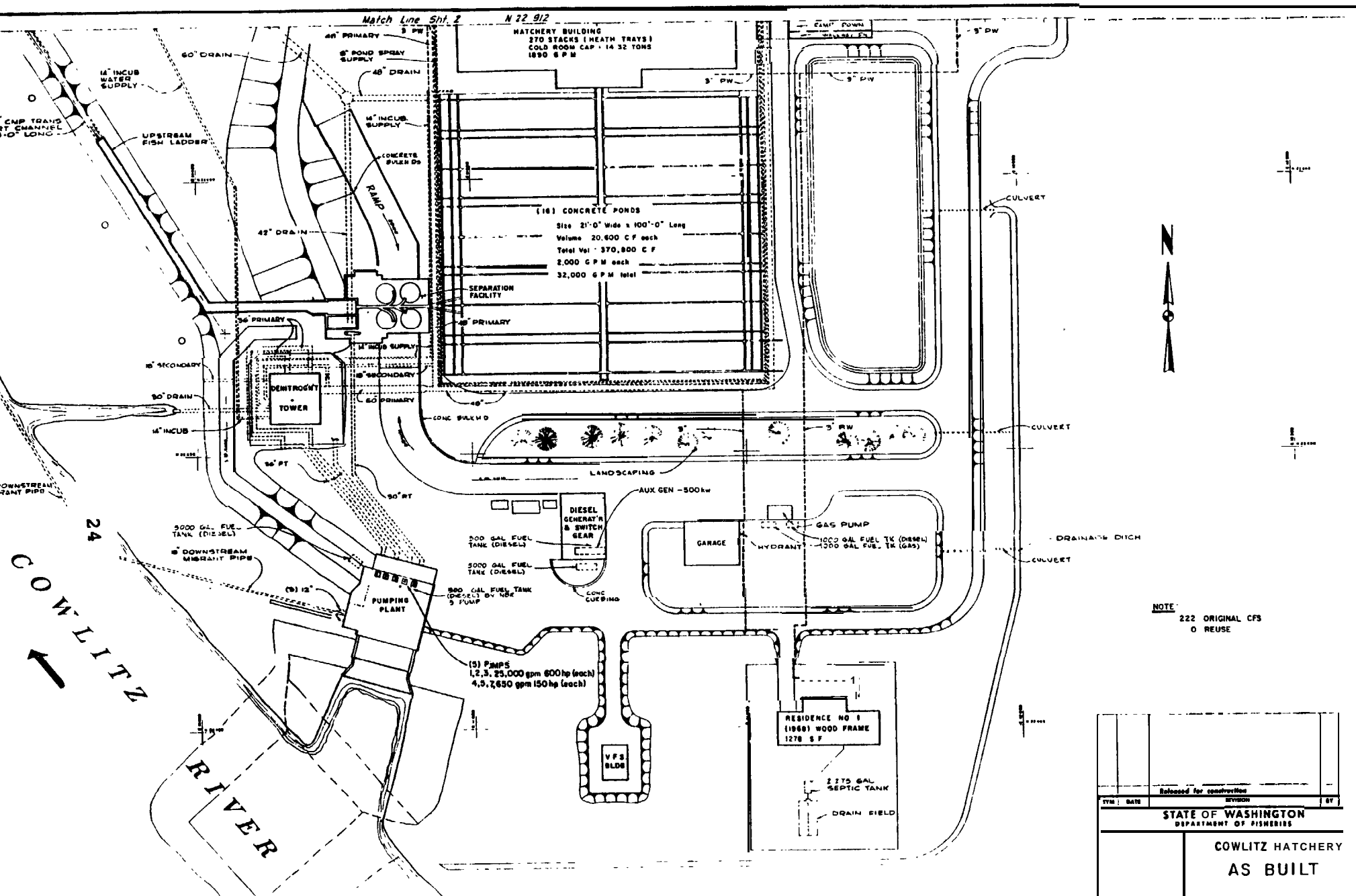
### Hatchery Expansion Capability

The hatchery is situated on land owned by Tacoma City Light. Property on existing hatchery is available and suitable for hatchery expansion. Additional water from the Cowlitz River is available in large quantities. Development of additional well

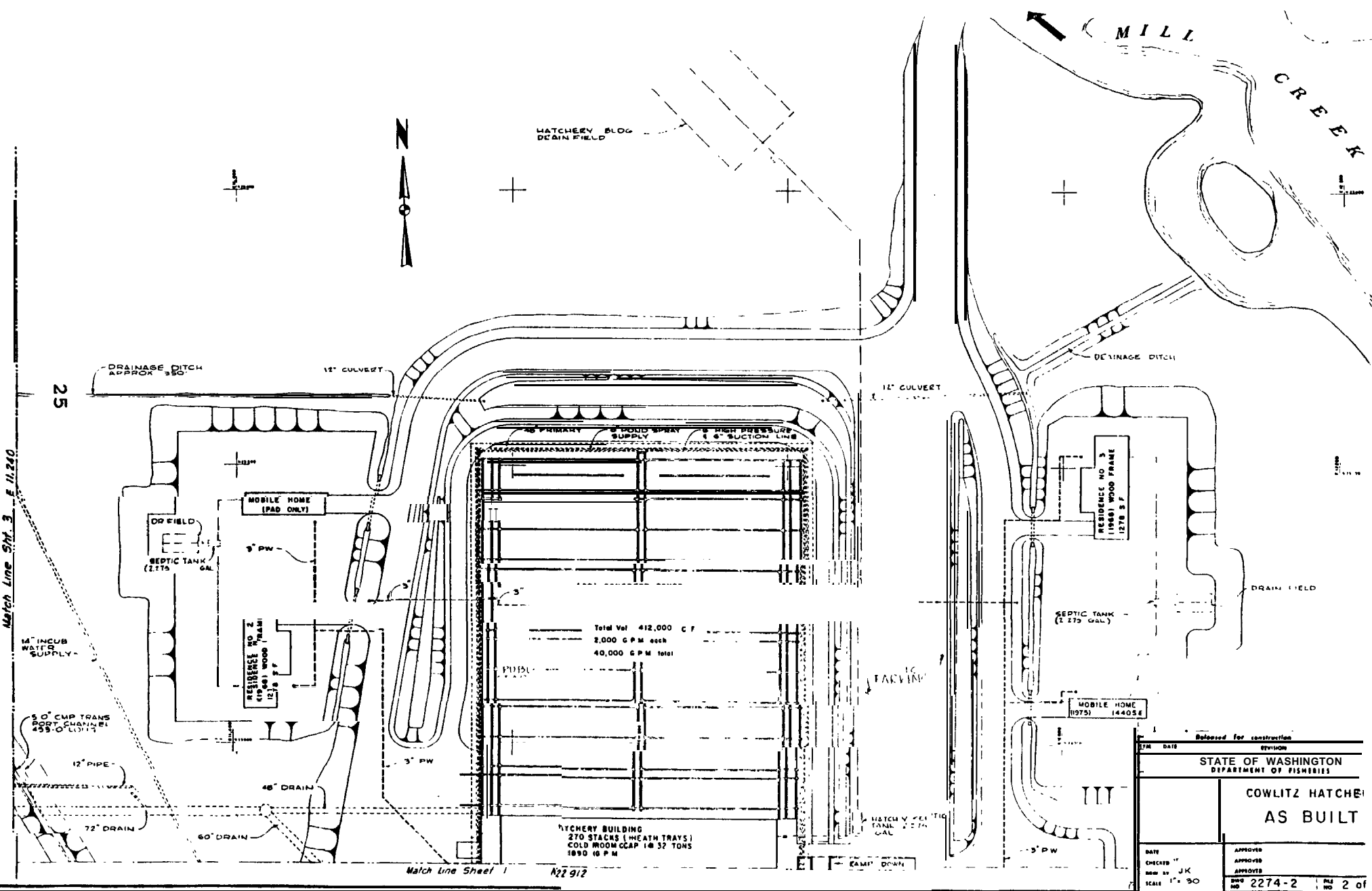
water has been attempted, but has not been successful in the past.

Expansion capabilities at Cowlitz hatchery are virtually limitless. Land and river water are available. Seven, 1/2 acre release ponds could be constructed. These ponds could produce 1,500,000 spring chinook smolts weighing 150,000 pounds (from two ponds) and 6,000,000 coho weighing 400,000 pounds (from five ponds). Each pond would be supplied with 4,488 gpm (10 cfs) river water. Early rearing facilities, pumping equipment, plumbing, etc would also have to be provided to accommodate this increase in production.

Improving the planting facilities to allow direct out-planting below the barrier dam would improve adult survival. Off station release ponds along the river are another option for expanding production, but has not been quantified in this report. Fry planting the Coweeman River with fall chinook (500,000) could be done with existing facilities. Some level of fry production could be used to help re-establish anadromous fish runs above Mayfield and Mossyrock Dams as addressed in the Cowlitz subbasin report. Fry plants are not identified in this report as potential production increases.



Match Line Sym. 3 - E 11,240



HATCHERY BLDG  
DRAIN FIELD

MILL  
CREEK

25

DRAINAGE DITCH  
APPROX. 380'

12" CULVERT

12" CULVERT

DRAINAGE DITCH

DR FIELD  
SEPTIC TANK  
(2,275 GAL.)

MOBILE HOME  
(PAD ONLY)

RESIDENCE NO 2  
(19481 WOOD FRAME)  
1278 S.F.

Total Vol. 412,000 C.F.  
2,000 G.P.M. each  
40,000 G.P.M. total

PUMP

3" PW

48" DRAIN

60" DRAIN

HATCHERY BUILDING  
270 STACKS (WHEATH TRAYS)  
COLD ROOM CAP 14 3/4 TONS  
1980 10 P.M.

HATCHERY BLDG  
DRAIN FIELD

SEPTIC TANK  
(2,275 GAL.)

MOBILE HOME  
(1975) (14405 E)

RESIDENCE NO 3  
(19481 WOOD FRAME)  
1278 S.F.

DRAIN FIELD

Released for construction	
DATE	REVISION
STATE OF WASHINGTON DEPARTMENT OF FISHERIES	
COWLITZ HATCHERY AS BUILT	
DATE CHECKED BY SCALE	APPROVED APPROVED APPROVED
11 JK 1" = 30'	NO. 2274-2 PL. NO. 2 of

Elokomin Hatchery  
1318 State Highway 407  
Cathlamet, Wa 98612

Funding Agency: NMFS  
Species Reared: Fall Chinook  
Coho

Manager: Dick Aksamit  
Phone #: (206) 795-3608

### Introduction

Elokomin Hatchery is located along the Elokomin River 7 miles upstream from the mouth. Beaver Creek Hatchery, a WDW operated facility is located about 2 miles downstream. Elevation of the facility is 97 feet above sea level. The hatchery was constructed and began operation in 1954 under Mitchell Act authorization as part of the Columbia River Fisheries Development Program (CRFDP). The facility is staffed with 4.33 FTE's.

The facility consists of 20 raceways, 4 large ponds, and hatchery building with troughs and incubators. All are in good condition except for pond 21 (in poor condition).

Fall chinook and coho are reared here. Fall chinook adults are trapped in the lower Elokomin River and transported to the hatchery for spawning in September and October. Fish are trapped due to low flows in the river during the chinook return time. Coho return to the hatchery during November and December and are spawned. Fall chinook are released the first spring after hatching and coho as yearling smolts. All are released on-station.

Water rights total 20,583 gpm from 4 sources; Elokomin River, well, an Unnamed Stream, and Clear Creek. The well is used for domestic purposes only. The Elokomin River supplies the majority of water to the rearing units (94% of average flow) with other sources being Clear Creek and Stream A. Clear Creek is used to supply the hatchery building for egg incubations. Intake #1 on the Elokomin River can also supply incubation facilities in an emergency. Raceways and ponds are supplied by an upper and lower intake on Elokomin River and from Stream A. Actual water available to the hatchery ranges from 8,310 gpm to 12,200 gpm and averages 10,100 gpm. Water is supplied to rearing units by gravity flow. There is also a pump on the Elokomin River capable of pumping 1,200 to 1,500 gpm but is primarily used as a standby water source.

Water from raceways is re-used in pond 21 (2,200 to 4,500 gpm) and/or pond 22 (2,200 to 4,500 gpm). Pond 23 receives water **from** raceways and pond 22.

### Current Production Constraints

Available flow to rearing ponds is limiting production. Extensive re-use of water is required to rear juveniles and hold adults. If



additional water could be supplied to allow more ponds to receive single pass flow, production could probably be increased and smolt quality improved. Oxygen depletion is a problem at times in ponds receiving re-use water.

Quality of incubation water has been deteriorating as logging occurs in the watershed. Incubation with well water would be desirable.

The adult holding pond is in poor condition, flow pattern is not uniform, and is supplied with re-used water. Adult mortality is high with some years approaching 30% to 40% for fall chinook. Although a supply of fresh single pass water would help, it would not solve the entire problem as adult holding and spawning facilities need replacing.

Adult fall chinook are trapped in the lower river and transported to hatchery for holding and spawning. Adults are stressed and some of the mortality described above can probably be attributed to the truck transport from trap to hatchery. A holding pond/trapping facility for adult chinook would be best on lower river and could also be used as a fall chinook release pond.

Ponds 21 and 22 are shaped so that flow patterns are uneven. These ponds are also dirt bottomed.

### Theoretical Production

Theoretical production based on the flow method is 127,239 pounds and with density is 383,069 pounds. Average production was 134,722 pounds and the 1987 agency goal was 108,165 pounds. Theoretical calculations include only the four rearing ponds. The 20 raceways are not included because all smolts are released from the rearing ponds and raceways are used to hold the following years coho smolts. Fish are transferred from raceways to rearing ponds prior to release. Theoretical calculations were computed as follows:

#### Flow Method:

Fall Chinook:  $1.61 \times 3,000 \text{ gpm} \times 3.46" = 16,712 \text{ lbs} *$   
 $1.61 \times 4,000 \text{ gpm} \times 3.46" = 22,282 \text{ lbs}$

Coho:  $1.61 \times 3,000 \text{ gpm} \times 5.22" = 25,213 \text{ lbs} *$   
 $1.61 \times 3,500 \text{ gpm} \times 5.22" = 29,415 \text{ lbs} *$   
 $1.61 \times 4,000 \text{ gpm} \times 5.22" = \underline{33,617 \text{ lbs}} **$   
127,239 lbs

#### Density Method

Fall Chinook:  $.3 \times 58,000 \text{ cu ft (pd 21)} \times 3.46" = 60,204 \text{ lbs} *$   
 $.03 \times 135,360 \text{ cu ft (pd 23)} \times 3.46" = 14,050 \text{ lbs} ***$

Coho:  $.3 \times 58,000 \text{ cu ft (pd 21)} \times 5.22" = 90,828 \text{ lbs} *$   
 $.3 \times 64,000 \text{ cu ft (pd 22)} \times 5.22" = 100,224 \text{ lbs} *$   
 $.3 \times 75,200 \text{ cu ft (pd 23b)} \times 5.22" = \underline{117,763 \text{ lbs}} **$   
383,069 lbs

- \* Ponds are supplied with 80% re-use water and normal practice would be to rear about half the production level of a single pass system.
- \*\* Pond is supplied with 100% re-use water, and normal practice would be to rear about half the production level of a single pass system.
- \*\*\* A density index of .03 was used in pond 23 for fall chinook and .3 was used for coho for the same pond. This is because the fall chinook are started in the upper half of the pond and coho are in the other half. The chinook, after coho are released are given the entire pond to rear in and WDF considers the flow patterns in whole pond as less efficient.

Comparison of the 2 theoretical calculations appears to indicate that flow is the factor limiting production. If additional water could be supplied, production increases should be possible. There is some additional water available from the Elokom River in the spring, but none during summer or fall months. The time when additional water is available would allow for a potential increase in fall chinook only.

Production based on the density calculation is not achievable even if sufficient water were provided to match space. The 4 large rearing ponds with uneven flow patterns and two of them with dirt bottoms can not support this poundage.

### Hatchery Expansion Capability

The hatchery is situated on 39 acres owned by WDF. Approximately 90% of the land is being utilized. The remaining land is not suitable for expansion. Additional river water is available during the spring but not in the summer and fall. Groundwater from wells is unavailable at this site. The limited amount of water available restricts any expansion capabilities. Water is re-used extensively and the limited flow available keeps this station from realizing its production potential.

An adult holding pond located in the lower river next to the trap is needed to improve adult survival prior to spawning. This pond would be supplied with about 5,386 gpm (12 cfs) and also would be capable of rearing about **1,500,000** fall chinook weighing 18,750 pounds.

Net pens in the lower river have been proposed for yearling coho production. Two net pens have been used in this report to quantify production, but potential for number of net pens may be much greater. Additional surveys and rearing experience is needed

before the full potential for this type of rearing system can be identified. The estimated initial cost is between \$15,000 to \$18,000 per 100,000 smolts. The expansion capability is estimated to be 100,000 coho smolts weighing 6,667 pounds.



Grays River Hatchery  
P.O. Box 768  
Grays River, Wa. 98621

Funding Agency: NMFS  
Species Reared: Fall Chinook  
Coho

Manager: Ken Jansma  
Phone #: (206) 465-2446

## Introduction

Grays River Hatchery is located at about river mile 2 of the West Fork Grays River, a tributary of the lower Columbia River. Hatchery elevation is 100 feet above sea level. The WDF owns and operates the facility on land acquired from the Weyerhaeuser Corporation. The hatchery was authorized and constructed under the Mitchell Act and began operation in 1961 as part of the CRFDP. Weyco Pond has been operated as a satellite facility in the past, but is not currently being used. The facility is staffed with 3.5 FTE's.

The rearing units are in poor to good condition and consist of 10 raceways, 1 dirt rearing pond, and 2 adult concrete holding ponds (also used for juvenile rearing). Water supplied to raceways, dirt rearing pond, and 2 adult holding ponds is approximately 250 to 350 gpm each, 700 to 1,000 gpm, and 350 to 850 gpm (one pond receives 350 to 500 gpm, the other pond 600 to 850 gpm) respectively. The river intake is located approximately .5 miles upstream from the hatchery. Fall chinook and coho smolts are normally released on station.

Adult fall chinook return in September and October. Low river flows during this time make it very difficult for the adults to make it to the hatchery. Smolts are released during the spring or early summer, or in the case of fall chinook some fall releases have also occurred. Fall chinook are released as zero plus age smolts and coho as yearling smolts.

Water rights total 22,488 gpm from 3 sources: West Fork Grays River, Unnamed Stream, and Wells. The majority of the water is supplied by gravity flow from West Fork Grays River. Average flow, utilized is 6,136 gpm. During the summer/fall months virtually the entire river flow is diverted for use in the hatchery. up to 50% of river water is diverted during higher flows. After heavy rains the river is often turbid, possibly aggravated by upstream logging practices.

Well water can be used only from October through April as the supply essentially dries up during summer months. Well water is used for incubation when the river is too turbid or for warming the river water. The Unnamed stream is only used from October through January and is supplied by gravity flow. Re-use water is supplied to adult holding ponds from raceways.

### Current Production Constraints

Low flows in the fall prevent adult fall chinook from returning to hatchery in many years.

Hatchery manager believes that hatchery is over programmed.

Coho incubated in deep troughs are susceptible to outbreaks of low temperature disease.

A river intake exists on the East Fork Grays River with water rights for 12 cfs, however it has not been operated for several years.

### Theoretical Production

Theoretical production based on the flow method is 42,300 pounds and with density is 51,053 pounds. Average production was 50,127 pounds and the 1987 agency goal was 28,092 pounds (includes only coho, no fall chinook goal provided in 1987). If the 1986 fall chinook agency goal is used we obtain a goal of 49,592 pounds. Theoretical calculations were made as follows:

#### Flow Method

Fall Chinook:	1.8 X 4,450 gpm X 3.4" =	27,234 <b>lbs</b>
Coho:	1.8 X 1,550 gpm X 5.4" =	<u>15,066 lbs</u>
		42,300 lbs

#### Density Method \*

Fall Chinook:	.03 x 71,100 cu <b>ft</b> x 3.4" =	7,252 lbs
	.3 X 31,650 cu ft X 3.4" =	32,283 lbs
Coho:	.03 x 71,100 cu <b>ft</b> x 5.4" =	<u>11,518 lbs</u>
		51,053 <b>lbs</b>

- \* Fall chinook were calculated using the 3 large rearing ponds and 6 raceways. Coho calculations used the same 3 large rearing ponds. Fall chinook use the same facilities after coho are released. The remaining raceways are being used to rear juvenile coho to be released as smolts the following year.

Comparison between the 2 theoretical calculations indicates that that flow appears to be the limiting factor in production. The agency goal and actual production is close to theoretical density calculation, but the hatchery manager indicates that production is over programed in his opinion.

Density calculations used the same rearing ponds for both fall chinook and coho. This facility is not capable of holding this poundage on station at any one time.

### Hatchery Expansion Capability

The hatchery is situated on 15 acres owned by WDF. Approximately 80% of the land is being utilized. The remaining property is not suitable for expansion. The hatchery is surrounded by private landowners and the potential for obtaining additional suitable land is unknown. Additional water from Grays River is available in the spring but not during other times. The entire river is used during summer and fall months. There is no additional ground water potential from wells. Existing wells can not be used year round because they essentially dry up in the summer.

By expanding the river intake and delivery line to supply an additional 10 to 20 cfs of water to the hatchery in the spring, production could be increased in the existing ponds. An estimated 1,000,000 additional fall chinook weighing 12,500 pounds could be produced. This may also require expansion of egg incubation and fry starting facilities.

Net pens in the lower river have been proposed for rearing yearling coho. Estimated initial cost is \$15,000 to \$18,000 per 100,000 smolts produced. Two net pens have been identified in this report with a proposed production of 100,000 coho weighing 6,667 pounds. The actual potential for net pens may be much greater. It will require additional surveys and rearing experience before the true potential for this type of facility can be determined.





Weyco Pond  
(Grays River Rearing Pond)  
Grays River Hatchery  
P.O. Box 768  
Grays River, Wa. 98621

Funding Agency: NMFS (fish food)

Species Reared: Fall Chinook

Manager: Ken Jansma  
Phone #: (206) 465-2446

### Introduction

Weyco Pond is located on the West Fork Grays River in the lower Columbia River Basin. Elevation of the pond is 180 feet above sea level. The pond was constructed by the Weyerhaeuser Corporation and began operating as a satellite to Grays River Hatchery in 1976. Fall chinook have been reared in the past. During the three years evaluated, fish were reared and released only one year (1986). The pond is currently not being used. Staffing to operate the pond is included with Grays River Hatchery.

Fingerling fall chinook are transferred in from Grays River Hatchery during late winter/early spring. They are reared until release in June. No adults are collected at this site.

Water rights total 13,690 gpm from 2 sources; Grays River (8,977 gpm) and Alder creek (4,713 gpm). Up to 8,977 gpm (20cfs) has been used in the pond during spring months. Virtually the entire flow from Alder Creek is used in the spring, but this source dries up in the summer. Weyerhaeuser uses the pond to fill helicopter water buckets during summer months for fighting forest fires.

### Current Production Constraints

Pond currently not utilized.

No additional information provided.

### Theoretical Production

Theoretical production for fall chinook based on the flow method is 43,646 pounds and with density is 95,971 pounds. Theoretical production with coho is 69,320 pounds (flow method) and 152,425 pounds (density method). Actual production for the 1 year releases were made (1986) was 13,280 pounds and the 1986 agency goal was 10,000 pounds. Theoretical calculations were made as follows:

#### Flow Method

Fall Chinook:  $1.43 \times 8,977 \text{ gpm} \times 3.4" = 43,646 \text{ lbs}$   
or  
Coho:  $1.43 \times 8,977 \text{ gpm} \times 5.4" = 69,320 \text{ lbs}$

Density Method

Fall Chinook:  $.03 \times 940,900 \text{ cu ft} \times 3.4" = 95,971 \text{ lbs}$

or

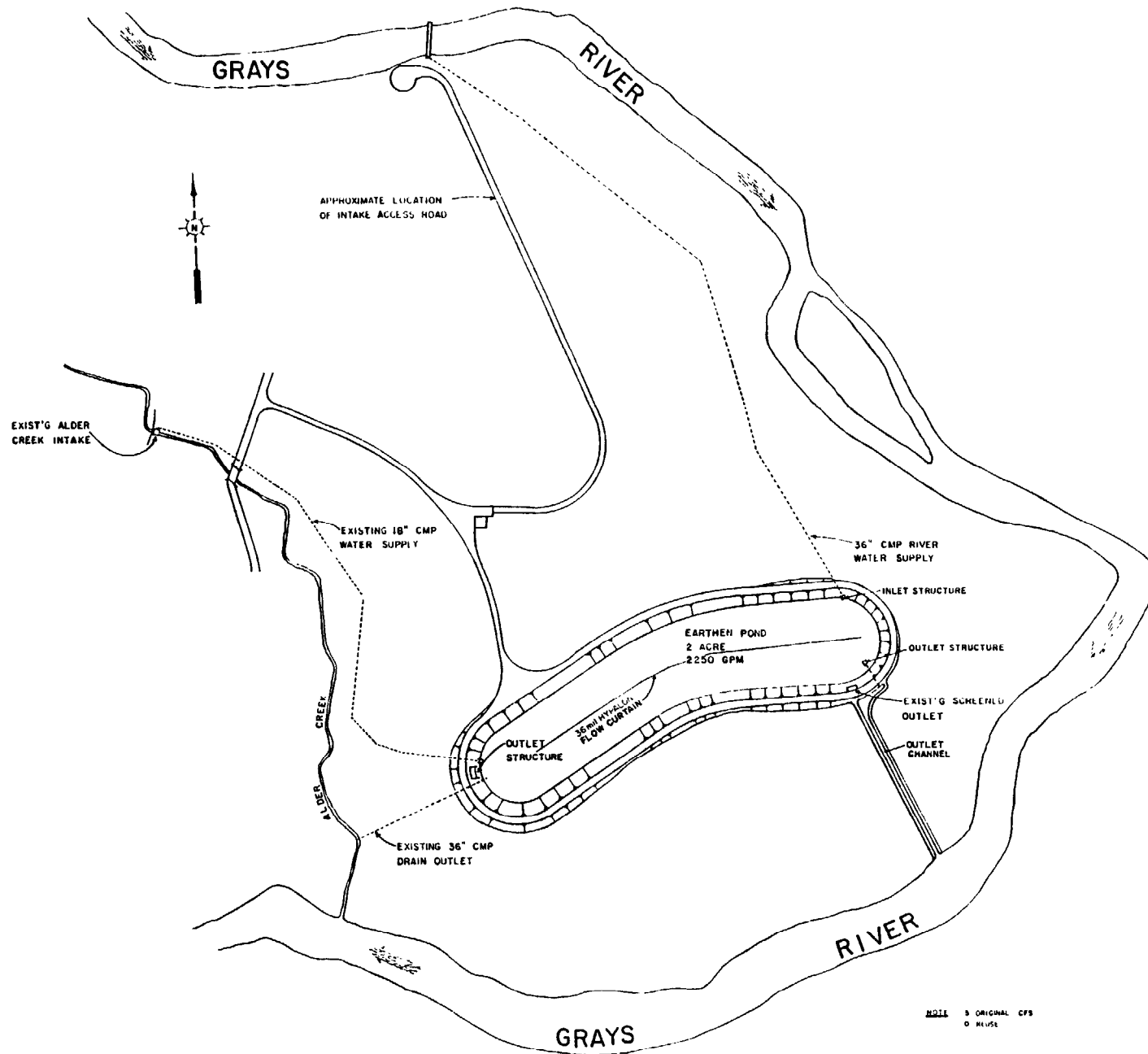
Coho:  $.03 \times 940,900 \text{ cu ft} \times 5.4" = 152,425 \text{ lbs}$

Based on comparison of the 2 theoretical methods it appears that flow is probably the limiting factor in production. Actual production and agency goal is well below theoretical calculations. This is a large pond with inefficient flow patterns and production based on any density index is not achievable.

Hatchery Expansion Capability

The pond is situated on 16 acres owned by WDF. Approximately 100% of the property is being utilized. There is no expansion capability on the present site. Additional water is not available from Alder Creek, but Grays River could supply additional flow. The pond is currently not being used.

The WDF estimates this pond is capable of rearing approximately 3,500,000 fall chinook weighing 43,750 pounds given a funding source. Incubation and fry starting facilities at Grays River may also require expansion to support this production.



NOTE: S ORIGINAL CFS  
O REUSE

0 50 100 200 300 400

Released for construction			
SYM	DATE	REVISION	BY
STATE OF WASHINGTON DEPARTMENT OF FISHERIES			
WEYCO POND			
AS BUILT			

Kalama Falls Hatchery  
Box 3900, Kalama River Road  
Kalama, Wa. 98625

Funding Agency: NMFS  
Species Reared: Fall Chinook  
Coho  
Spring Chinook

Manager: Ron Castaneda  
Phone #: (206) 673-4825

## Introduction

Kalama Falls Hatchery is located along the Kalama River at about river mile 10. The nearest town is Kalama, approximately 12 miles south of the hatchery. Elevation of the site is 100 feet above sea level. The facility was constructed under Mitchell Act authorization and began operating in 1958 as part of the CRFDP. The hatchery is staffed with 5.67 **FTE's**.

Gobar Pond was operated as a satellite facility for final rearing of spring chinook during this evaluation. Spring chinook releases from Gobar Pond are summarized in this section of the report. For a physical description of Gobar Pond refer to the WDW report.

The rearing units are in poor to good condition and consist of 12 raceways and 6 adult holding ponds. The holding ponds are also used for rearing juveniles. The fish ladder at the hatchery was originally constructed to pass fish around Kalama Falls, but was later incorporated into the hatchery when that facility was later built. Adult fish can not enter the adult holding ponds directly from the fishway. They are trapped and lifted into trucks and then transported to the holding ponds a few hundred feet away.

Spring chinook adults are collected at the hatchery from May through September and are spawned in September. Fry are usually ponded into 2 raceways at approximately 350,000 fish each in late December or early January. During this evaluation period they were transferred to Gobar Pond in October or November and reared until release in February. Smolts were released in February to free up the pond for steelhead from WDW hatcheries. Currently, spring chinook are transferred to Lower Kalama Hatchery instead of Gobar Pond and reared until release in late March or April.

Early and late coho return to this hatchery. Both are spawned, the early coho are transferred to Lower Kalama Hatchery as green eggs, fertilized, incubated, reared, and released in May as yearling smolts. The late coho are spawned and reared at Kalama Falls. They are ponded into 2 raceways in April. After fall chinook have been moved to rearing ponds in May, coho are split into all 10 raceways for a period until moved to the 6 rearing ponds for final rearing and release as yearling smolts.

Most adult fall chinook are trapped at Modrow Trap in the lower Kalama River. Fry are ponded into 8 raceways, reared for a period, and then split into the 6 rearing ponds the first part of May for

final rearing and release in June.

Water rights total 8,055 gpm from 4 sources; Little Kalama River, 2 Unnamed Creeks, and a Well (for domestic water). The majority of water is supplied from the Kalama River with the 2 unnamed creeks providing seasonal water. Five 25 horsepower pumps provide an average of 5,500 gpm river water year round.

The 2 unnamed creeks provide 1,200 gpm in January but dwindle to practically nothing in September. The creeks supply water by gravity flow and are used primarily for incubation but can be supplied to the rearing ponds. Flow and water quality have deteriorated in recent years probably due to logging in the watersheds.

Approximately 5,500 gpm drains from all 12 raceways and is used as the sole water supply for the 6 large rearing ponds. This flow is reduced to 4,500 gpm during periods when eggs are being incubated. Raceway water can be re-used and can flow into any or all rearing ponds.

#### Current Production Constraints

Available flow to rearing units is limiting production. If sufficient single pass water could be supplied to raceways and rearing ponds production could increase. It is estimated that production could increase in the existing facility by 1,900 pounds for each 448 gpm (1 cfs) of additional water that could be provided up to the density limitations.

Rearing ponds can receive re-use water Only (from raceways).

Hatchery needs a total rebuild including fishway modifications so adults can enter holding ponds without being trapped. Rebuilding hatchery could possibly double current production if sufficient water was provided.

The current fishway should be extended so adults can enter holding ponds. Spring chinook hold in and below the fishway.

#### Theoretical Production

Theoretical production based on the flow method is 118,324 pounds and based on density is 239,770 pounds. Average production was 145,869 pounds including the spring chinook releases from Gobar Pond. The average releases with spring chinook subtracted out was 113,097 pounds (This number should be used in comparison with theoretical production because Gobar Pond is not used in theoretical calculations). The 1987 agency goal was 115,250 pounds. Theoretical calculations were made as follows:

#### Flow Method

Fall Chinook:	1.36 X 1,000 gpm X 3.44" X 6 ponds =	28,070 lbs *
	1.36 X 500 gpm X 3.44" X 8 raceways=	18,714 lbs
Coho:	2.16 X 1,000 gpm X 5.52" X 6 ponds =	<u>71,540 lbs</u> *
		118,324 lbs

#### Density Method

Fall Chinook:	.3 X 12,000 cu ft X 3.44" X 6 ponds =	74,304 lbs *
	.3 X 5,600 cu ft X 3.44" X 8 raceways=	46,234 lbs
Coho:	.3 X 12,000 cu ft X 5.52" X 6 ponds =	<u>119,232 lbs</u> *
		239,770 lbs

- \* Supplied with 100% re-use water. Normal hatchery practice would be to rear only half this poundage. The 6 rearing ponds have been used twice in theoretical calculations since the agency releases both fall chinook and **coho** (double crops) from them.

Based on comparison of the 2 theoretical calculations it appears that the limiting factor in production is flow. The theoretical calculation assumes all single pass water which is not now possible. The WDF indicates that if sufficient water was supplied then production would be possible up to the theoretical density poundage. Because rearing ponds have been used twice in calculations, this facility is not capable of holding the poundages calculated on station at one point in time.

#### Hatchery Expansion Capability

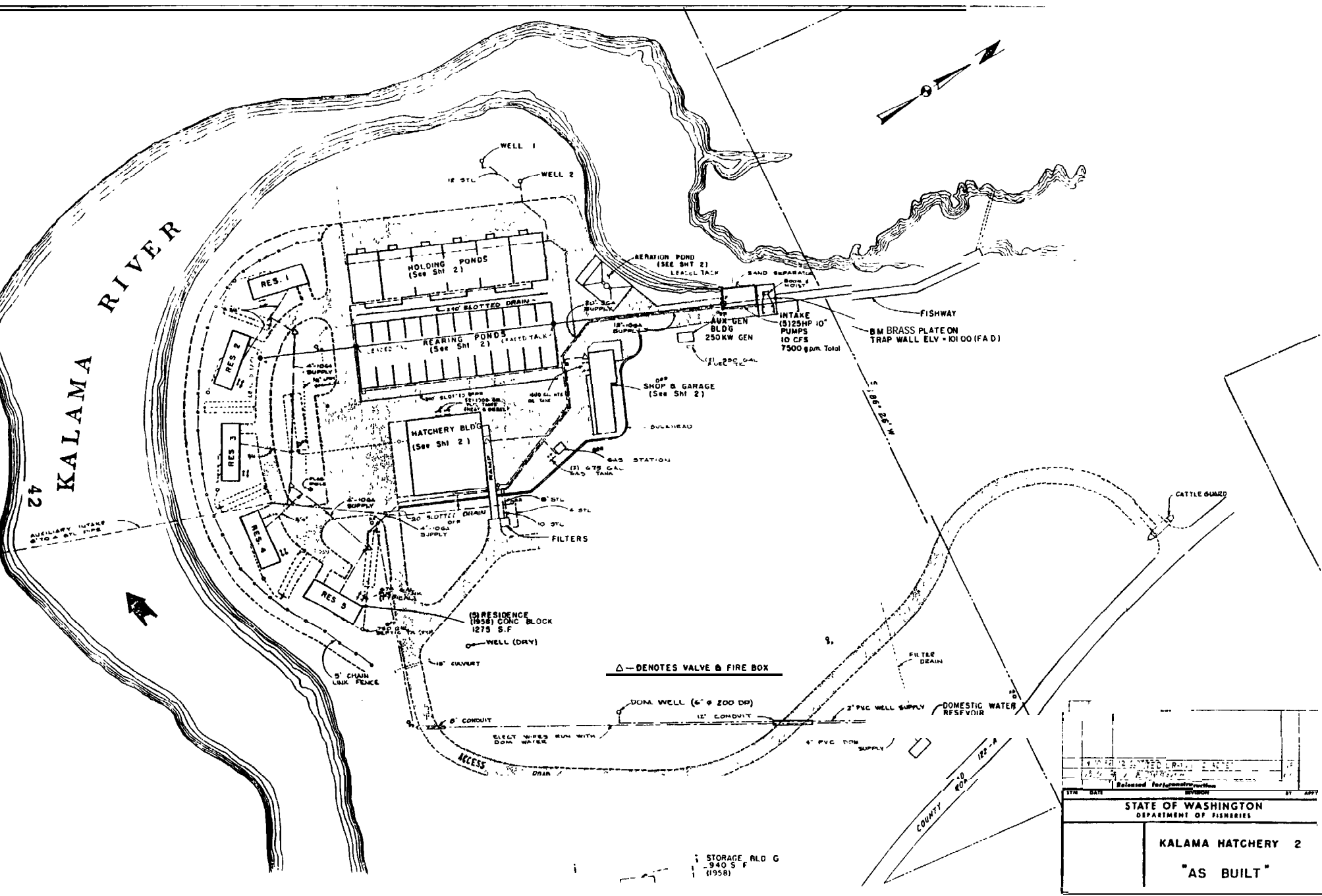
The hatchery is situated on 70 acres owned by WDF. Approximately 25% of the land is currently being utilized. The remaining property is suitable for hatchery expansion. Additional water from the Kalama River is available. Additional well water is not available. There is approximately 30 cfs of undeveloped spring water at Romback Springs located on land owned by Weyerhaeuser. A station development plan from the early 1980's recommended rebuilding the hatchery.

Romback Springs could support two, 1/2 acre rearing ponds. These ponds could rear **1,000,000** spring chinook weighing 100,000 pounds.

If the hatchery was rebuilt and sufficient Kalama River water was provided then production at this hatchery could double from present levels. The potential production increase is summarized as follows:

	Numbers	Pounds
Fall Chinook	<b>3,740,000</b>	46,800
Coho	<u>1,000,000</u>	<u>66,667</u>
	<b>4,740,000</b>	113,467

With the two Romback Springs rearing ponds this facility is capable of expanding production by a total of 213,000 pounds. Production increases of this size will also require additional incubation and early rearing facilities.





Klickitat Hatchery  
301 Fish Hatchery Road  
Glenwood, Wa. 98619-9102

Manager: Don Peterson  
Phone #: (509) 364-3310

Funding Agency: NMFS  
Species Reared: Fall Chinook  
Coho  
Spring Chinook

## Introduction

Klickitat Hatchery is located in a remote area on the Klickitat River at river mile 35, near the town of Glenwood. The hatchery was constructed under the Mitchell Act and began operation in 1949 as part of the CRFDP. The hatchery was renovated in 1985. Access is down a 3/4 mile hill with an average grade of 17% (22% at steepest point) and can be hazardous during winter months. The hatchery is staffed with 5.7 FTE's.

The hatchery now consists of a hatchery building, 22 raceways, energy dissipation building with future hydroelectric capacity, freezer building, garage/shop, 4 bay Quonset hut, adult holding pond and 3 rearing/release ponds. There are 3 residences on station. The raceways were constructed during the 1985 renovation and are in excellent condition. The rearing ponds are all in poor to fair condition.

The current hatchery program includes 600,000 yearling spring chinook, 4,000,000 URB fall chinook, and 1,350,000 yearling coho for a total of 185,000 pounds. Adult spring chinook usually return in sufficient numbers to maintain production goals. Fall chinook eggs are usually imported from other stations. Lower river fall chinook (Tules) were reared in 1985 and 1986. The stock was changed to URB fall chinook beginning in 1987. Adult returns from URB'S have not begun returning so it is unknown if they will return in sufficient numbers to meet egg take goals. Coho eggs are imported from lower river hatcheries in most years. Most releases are made on-site.

Water rights total 28,338 gpm from 4 sources; Indian Ford Springs, Unnamed Spring, Wonder Springs, and Klickitat River. Water is supplied to raceways from Indian Ford Spring A (upper intake 5,500 gpm). This supplies each raceway with approximately 250 gpm.

A lower intake on Indian Ford Spring A supplies an average 1,300 gpm (approximately 2,200 gpm is available so some water is not utilized) to pond 24. Pond 24 also receives up to 5,500 gpm re-use water from hatchery building and raceways. Re-use water available is reduced to 3,500 gpm when adult holding pond is operating.

Pond 26 obtains water from Wonder Springs (5,100 gpm). Pond 25, an acclimation pond is supplied from Klickitat River (average 8,000 gpm) and Indian Ford Spring B (average 1,300 gpm). The Klickitat River can freeze over in the winter, therefore this pond is limited

to post winter use.

### Current Production Constraint

The water distribution system appears to be the limiting factor in production. Klickitat River water can only be used in the acclimation pond (pond 25). River water can not be used in the winter due to freezing. This limits pond 25 operation to spring time use only.

Wonder Springs Pond (pond 26) is supplied with excess water and could support 2 ponds with the existing flow.

Raceways are supplied with a maximum 300 gpm to 400 gpm each and if all raceways are in use only 250 gpm is supplied. Raceways are designed for 650 gpm so production should be able to be increased if additional water were provided.

Spring chinook juveniles are supplied with re-use water part of which comes from the adult holding pond. This is a potential problem as any diseases in adult fish can be passed on to the juveniles.

Adult holding pond needs to be enlarged. Current capacity is approximately 1,500 adults and any additional numbers have to be held in raceways. Re-use water is used to supply adult holding pond.

### Theoretical Production

Theoretical production based on the flow method is 177,081 pounds and with density is 338,330 pounds. Average production was 181,293 pounds and the 1987 agency production goal was 75,625 (this figure is incomplete). The current production goal is 201,600 pounds. Theoretical calculations were computed as follows:

#### Flow Method

Spring Chinook:	1.89 X 6,000 gpm X 6.92" =	78,473 lbs *
Fall Chinook:	1.89 X 5,000 gpm X 3.44" =	32,508 lbs
Coho:	1.89 X 6,700 gpm X 5.22" =	<u>66,100 lbs</u>
		177,081 lbs

#### Density Method \*\*

Spring Chinook:	.3 X 82,800 cu ft X 6.92' =	171,890 lbs *
Fall Chinook:	.3 X 39,560 cu ft X 3.44" =	40,826 lbs
Coho:	.3 X 80,213 cu ft X 5.22" =	<u>125,614 lbs</u>
		338,330 lbs

\* Supplied with re-use water, normal hatchery practice would be to rear only half this poundage.

- \*\* Only the rearing/release ponds are used in theoretical calculations. There are also 22 raceways with 66,000 cubic feet of rearing space. The WDF did not use raceways in calculations because no smolts are released from them. There are two, year classes of coho and spring chinook held on station and these juveniles are utilizing raceways in the spring when theoretical calculations were computed.

Based on comparison of the 2 theoretical calculations it appears that flow is the limiting factor in fish production. Average production, agency goal, and theoretical flow calculation are all similar and should be considered the hatchery capacity based on existing conditions. If additional water were supplied to raceways, production could increase.

#### Hatchery Expansion Capability

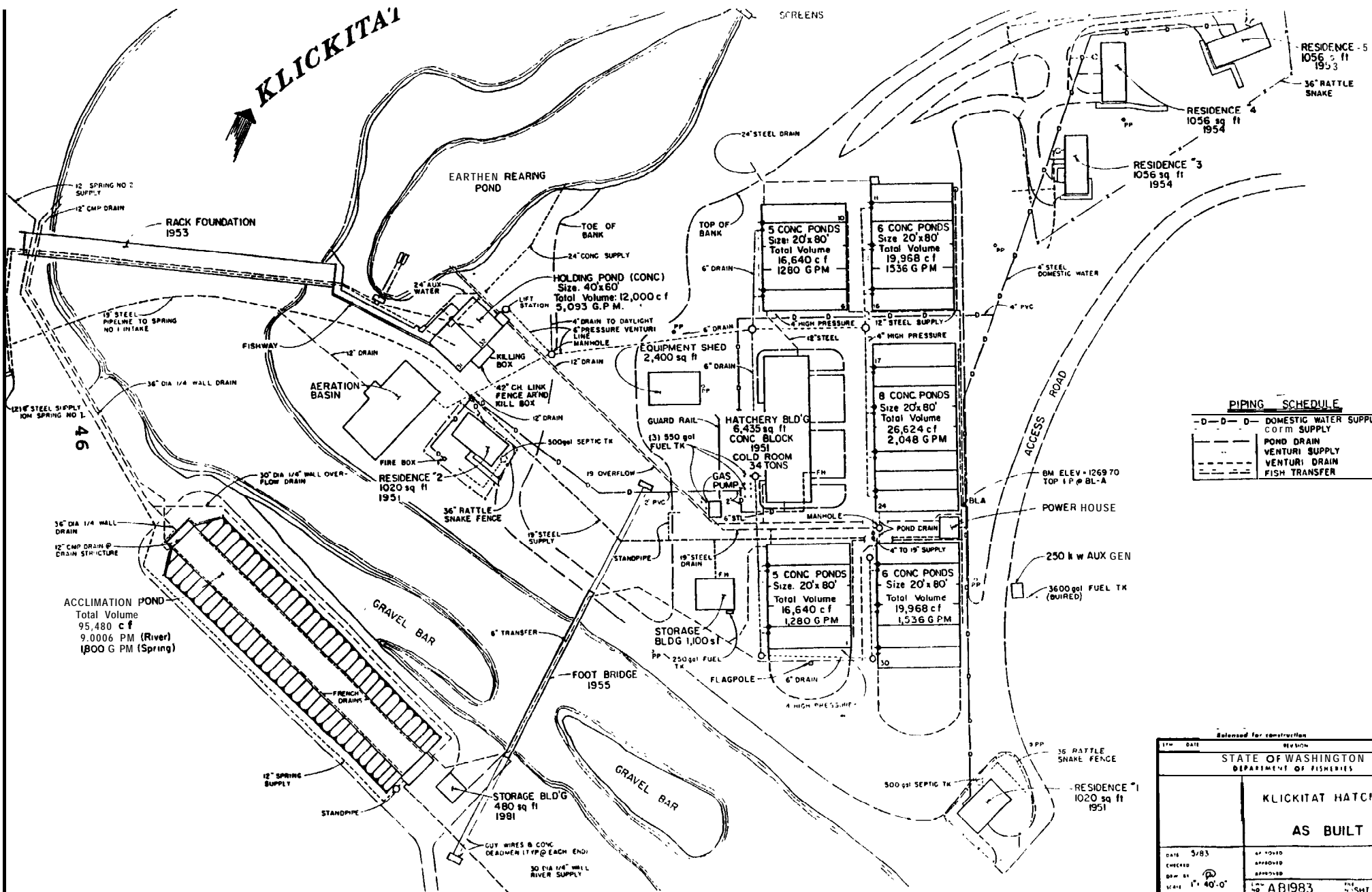
Ownership of land the hatchery is situated on is currently in dispute between WDF and Yakima Tribe. Little land is available for expansion on the present hatchery site, but there is room to construct a second pond to utilize the existing Wonder Springs water. Suitable land is located across the river, but again the ownership of that property is in dispute between WDF and the Yakima Tribe.

Upwards of 20,200 gpm (45 cfs) of additional spring water is located across the Klickitat River from the hatchery. The Yakima Tribe holds the water right to this water, so it may or may not be available for use at this facility. Some water from the existing spring supplies are not being used and could be made available. The Klickitat River could supply large amounts of water but could not be used in the winter. The availability of well water is unknown.

Current hatchery production is limited by the amount of water being supplied and the distribution system. Approximately 10 to 15 cfs of spring water described above and additional river water could be utilized to increase production in the existing facilities. This production increase has not been quantified because it is unknown if the Yakima Tribe would allow use of the spring water, but should be somewhere between the two theoretical methods calculated above. Investigations into the availability of the spring water is recommended as there is good potential for increased production at this facility.

A second rearing pond similar to the existing pond could be constructed to more efficiently utilize the Wonder Springs water supply. Production increase is estimated to be 1,000,000 fall chinook weighing 12,500 pounds.

**KLICKITAT**



**PIPING SCHEDULE**

-D-D-D-	DOMESTIC WATER SUPPLY
-D-D-	VENTURI SUPPLY
-D-D-	FISH TRANSFER

Released for construction

DATE	3/83	BY	10/10
CHECKED		APPROVED	
DATE	11/83	BY	10/10
CHECKED		APPROVED	

STATE OF WASHINGTON  
DEPARTMENT OF FISHERIES

**KLICKITAT HATCHERY**

**AS BUILT**

SCALE: 1" = 40'-0"

NO. AB1983

Lewis River Salmon Hatchery  
4404 Lewis River Road  
Woodland, Wa. 98674

Funding Agency: **PP&L, WDF**  
Species Reared: Fall Chinook  
Spring Chinook  
Coho

Manager: **Robin Nicolay**  
Phone #: (206) 225-7413

### Introduction

Lewis River Salmon Hatchery is located adjacent to the Lewis River, just downstream from Merwin Dam, about 8 miles east of Woodland. Elevation of the facility is 64 feet above sea level. The hatchery began operation in 1932. Currently 50% of funding is provided by WDF and 50% from Pacific Power and Light (**PP&L**). Speelyai Salmon Hatchery is operated as a satellite facility. Lewis River Hatchery is staffed with 6.33 **FTE's** and is shared back and forth between Speelyai as needed.

The rearing units are in good to excellent condition and consist of 12 raceways and 4 half acre rearing ponds.

Adult spring chinook return to hatchery and also are trapped at Merwin Dam. They are sorted, inoculated and then transported to Speelyai Hatchery for holding and spawning. Fall chinook were reared in 1985 and 1986 but are not currently being reared. Both early and late coho return to the hatchery or are trapped at Merwin Dam.

Water rights total 38,613 gpm from 3 sources; Lewis River, Unnamed Stream, and Colvin Creek. Water is currently supplied to the hatchery only from the Lewis River. Approximately 10,000 to 30,000 gpm is pumped from the Lewis River depending on need during the year. Water is not limiting at this station and the maximum could be supplied year round. If water is supersaturated with gas, it is passed through aerators to reduce gas levels prior to being supplied to rearing units. Pumped water can bypass aerators if gas level is acceptable. All rearing units are supplied with single pass water.

### Current Production Constraints

High and low water temperatures do not occur when needed for rearing fish. Corrosion in water lines is reducing flow being delivered to ponds.

Aeration tower can not handle maximum flow. Flow is restricted 25% when in use.

There is not enough incubation capacity or starter ponds. The water supplied to incubation facility is too warm. A cooler water supply is needed.

Fish transfers on station require either pumping and trucking **or** laying irrigation pipe across a county road.

### Theoretical Production

Theoretical production based on the flow method is 421,998 pounds and with density is 695,508 pounds. Average production was 443,154 pounds. No 1987 production goal was given but the current agency goal is 304,800 pounds. Theoretical calculations were computed as follows:

#### Flow Method

Spring Chinook:	$2.07 \times 7,000 \text{ gpm} \times 6.92'' =$	100,271 lbs
	$2.07 \times 660 \text{ gpm} \times 6.92'' \times 12 \text{ pds} =$	113,248 lbs
Coho:	$1.8 \times 7,000 \text{ gpm} \times 5.51'' \times 3 \text{ ponds} =$	<u>208,278 lbs</u>
		421,998 lbs

#### Density Method

Spring Chinook:	$.3 \times 80,000 \text{ cu ft} \times 6.92'' =$	166,080 lbs
	$.3 \times 4,000 \text{ cu ft} \times 6.92'' \times 12 \text{ pds} =$	99,648 lbs
Coho:	$.3 \times 80,000 \text{ cu ft} \times 5.51'' \times 1 \text{ pds} =$	132,240 lbs
	$.3 \times 90,000 \text{ cu ft} \times 5.51'' \times 2 \text{ pds} =$	<u>297,540 lbs</u>
		695,508

Comparison **of** the 2 theoretical calculations indicates that flow may be limiting factor in production, but the large rearing ponds may not be able to rear additional pounds even with more water. The WDF considers the water supply and ponds space to be well balanced at this facility. The current agency goal is less than either theoretical flow calculation or average production, but is due to a one year rebuild of intake which reduced flow. The agency considers production to be at capacity.

### Hatchery Expansion Capability

The hatchery is situated on 119 acres owned by WDF. Approximately 25% of the property is being utilized. The remaining land is suitable for fish culture operations. Some additional land is also available at Cedar Creek. Water from the Lewis River is available in large quantities. Additional pumps or replacing existing pumps with larger ones would be needed. There is no groundwater available. A clean water supply of about 500 gpm is desirable for incubation.

Five, half acre rearing/release ponds could be constructed on the East Fork Lewis River and Cedar Creek. Each pond would need to be supplied with 4,488 gpm (10 cfs). Each pond could rear either

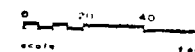
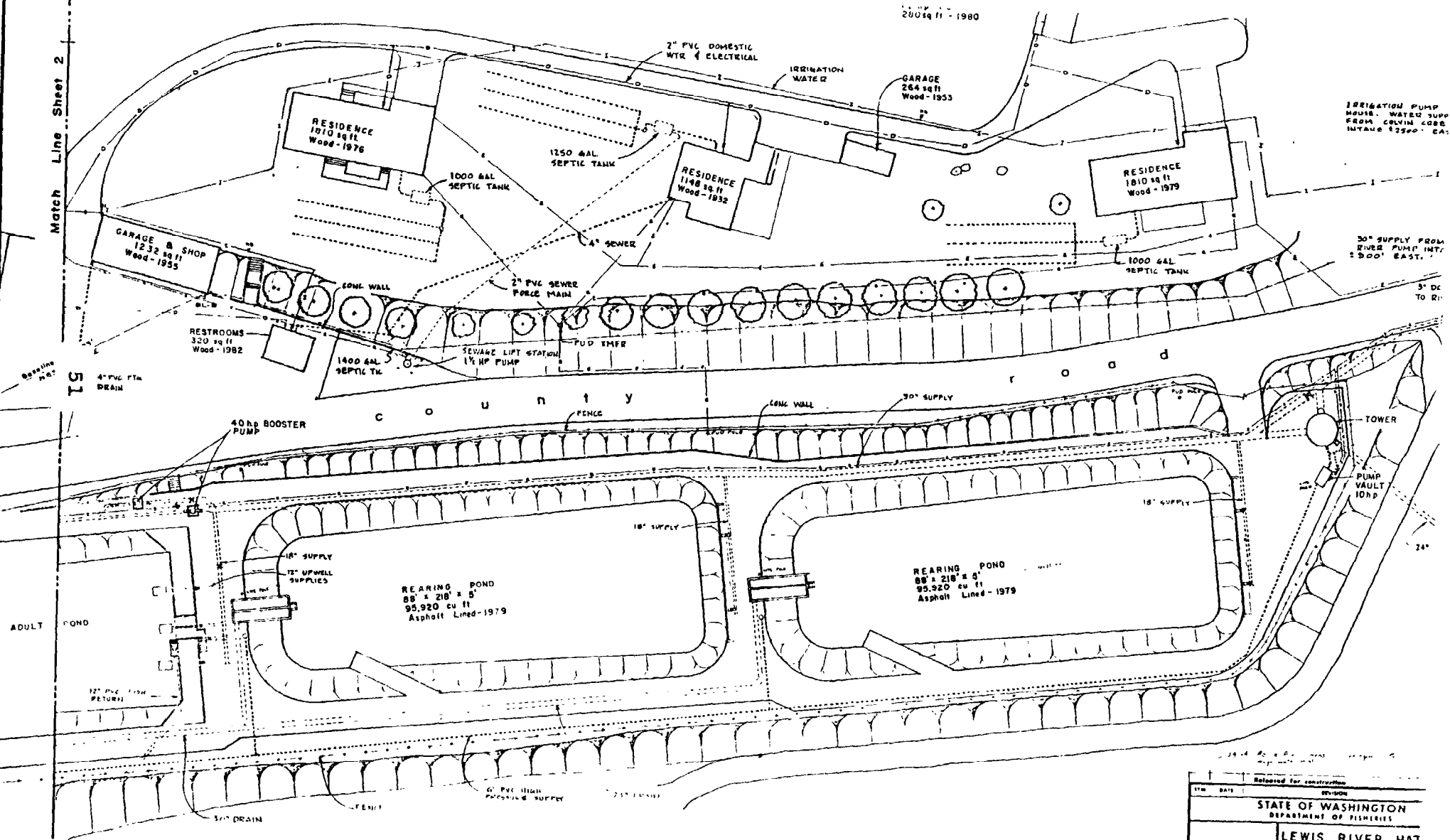
**1,000,000 coho** weighing 66,667 pounds or 600,000 spring chinook weighing 60,000 pounds. For purposes of this report, it is assumed that three ponds will support spring chinook and two ponds coho. The total production increase is estimated to be **2,000,000 coho** weighing 133,334 pounds and 1,800,000 spring chinook weighing 180,000 pounds. Additional incubation and starter ponds will be required to support this production.



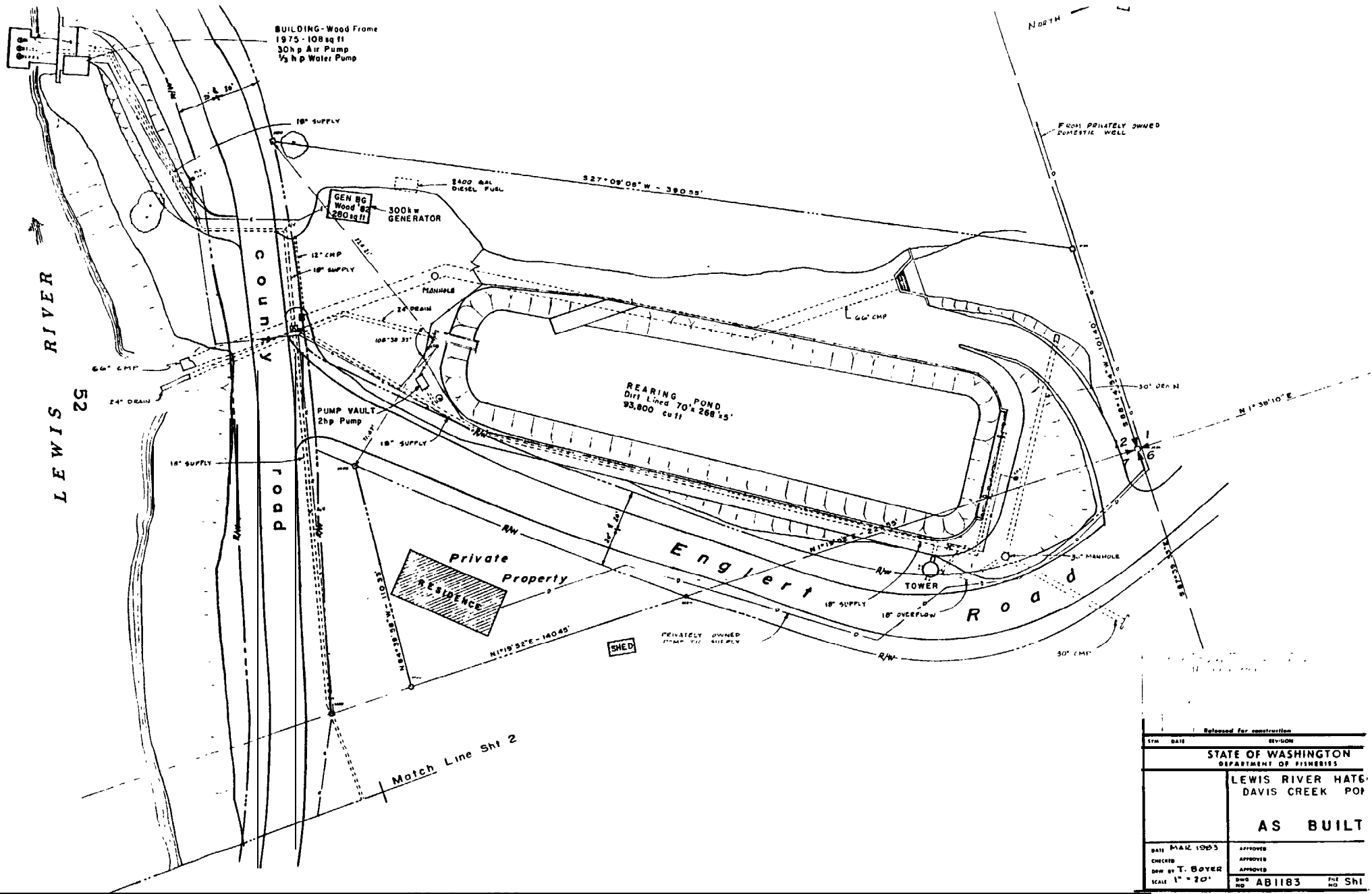


Match Line Sheet 2

19



Released for construction	
DATE	REVISION
STATE OF WASHINGTON DEPARTMENT OF FISHERIES	
LEWIS RIVER HAT	
AS BUILT	
DATE Checked By T. BOYER Scale 1" = 20'	APPROVED APPROVED APPROVED AB1183 SHI



Speelyai Salmon Hatchery  
11001 Lewis River Road  
Ariel, Wa. 98603

Funding Agency: **PP&L**  
Species Reared: Spring Chinook  
Coho

Manager: Steve Decker  
Phone #: (206) 231-4210

### Introduction

Speelyai Salmon Hatchery is located in a mountainous area at the upper end of Lake Merwin on the Lewis River, approximately 21 miles east of Woodland. Elevation of the site is about 500 feet above sea level. The hatchery began operation in 1954 and is owned and funded by **PP&L**. The hatchery was originally constructed to provide coho mitigation for lost habitat in the Lewis River System. This facility is operated as a satellite facility to the Lewis River Salmon Hatchery. The facility is staffed with 2.7 **FTE's** which is shared with Lewis River Salmon Hatchery when required.

The 12 raceways, .14 acre rearing pond, and adult holding pond are in fair condition. The raceways are made of concrete and the 2 ponds are asphalt lined. The adult holding pond is also used to rear fish.

During the 3 year evaluation, adult spring chinook, fall chinook, and coho were trapped at Merwin Dam and transported to holding ponds here. During a normal season, approximately **1,000,000** spring chinook, **1,000,000** fall chinook, and **2,500,000** coho eggs can be incubated. Fall chinook currently is not reared at this facility. Spring chinook smolts are released below Merwin Dam. Some coho are released into Merwin Lake but the majority are released below the dam.

Water rights total 6,732 gpm from Speelyai Creek. Average water being delivered to the hatchery equals water right and ranges from 5,835 gpm to 8,079 gpm and comes from Speelyai Creek. All raceways and ponds receive single pass water. The 2 ponds each receive 1,400 gpm and the raceways each receive 500 gpm.

### Current Production Constraints

Flow to ponds is limiting production, but any increase would also require additional ponds to handle the various species and year classes.

Production changes/increases would need to be negotiated with PP&L.

### Theoretical Production

Production potential based on the flow method is 68,904 pounds and

with density is 191,678 pounds. Average production was 75,568 pounds and the 1987 agency goal was 7,500 pounds (incomplete, data not provided). The current agency goal is 66,500 pounds of yearling coho production. Theoretical calculations were computed as follows:

#### Flow Method

Coho:	1.5 X 1,400 gpm X 5.22" X 2 ponds =	21,924 lbs
	1.5 X 500 gpm X 5.22" X 12 raceways =	<u>46,980 lbs</u>
		68,904 lbs

#### Density Method

Coho:	.3 X 18,000 cu ft X 5.22" X 2 ponds =	56,376 lbs
	.3 X 7,200 cu ft X 5.22" X 12 raceways =	<u>135,302 lbs</u>
		191,678 lbs

Based on comparison of the 2 theoretical calculations it appears that production is limited by the amount of water being supplied to rearing units. Production based on theoretical flow is only 36% of that calculated using the density method. The agency considers the water supply and pond space to be in balance.

### Hatchery Expansion Capability

The hatchery is situated on 15 acres owned by **PP&L**. Approximately 67% of the property is being utilized for fish culture. The remaining land is not suitable for hatchery expansion. Additional land owned by **PP&L** is located adjacent to hatchery, but the area is fairly steep and probably not suitable for fish culture. It is unknown if **PP&L** would support expansion. Additional surface water from existing source is not available. No groundwater is available at this site. Water from Lake Merwin could be developed, but would require pumping and additional ponds to utilize (there is no room to construct additional ponds).

The only potential for expanding production at this facility is to construct a net pen complex in Lake Merwin. The potential for successfully utilizing net pens to rear smolts at this site is unknown. A small scale experimental net pen program should be developed prior to any large scale project. For purposes of this report, it is assumed that two net pens could be constructed with 100,000 coho weighing 6,667 pounds produced. Initial cost is estimated to be \$15,000 to \$18,000 per 100,000 **smolts** produced. If this project were proven successful, WDF estimates a net pen complex capable of rearing **1,000,000** to **2,000,000** yearling coho could be developed.



Lower Kalama Salmon Hatchery  
1404 Kalama River Road  
Kalama, Wa. 98625

Funding Agency: NMFS  
Species Reared: Fall Chinook  
Coho

Manager: John Norton  
Phone #: (206) 673-4400

## Introduction

Lower Kalama Salmon Hatchery is located along the Kalama River 5 miles north of Kalama. The site is in relatively steep terrain at river mile 5. Elevation of the facility is 53 feet above sea level. The station began operation in 1895 and is one of the oldest hatcheries in the Columbia Basin. It is staffed with 2.75 **FTE's**.

Condition of the rearing units ranges from poor to good and consist of 8 raceways, 1 asphalt rearing pond (also used for adult holding), and 1 gravel rearing pond. Total rearing area is 161,200 cubic feet.

Fall chinook and early coho were reared during this evaluation. Adult fall chinook are trapped at Modrow Trap in the lower river and transported here or to Kalama Falls Salmon Hatchery for spawning. Chinook fry are ponded in raceways usually in January. They are moved to the asphalt pond in March and reared until release on-site in late April or May at 80 to 90 fish per pound.

Coho are spawned and approximately 500,000 fry are ponded into 1 raceway in March. They are split into 5 raceways in May and finally moved into the large gravel pond in September. Smolts are released on-site the following June at 15 fish per pound.

Although no spring chinook were reared during the evaluation period they are currently being raised. They are transferred in from Kalama Falls Salmon Hatchery in the fall and reared until release on-site the following spring. This production replaces the smolts which were reared at Gobar Pond.

Water rights total 15,112 gpm from 2 sources; Kalama River and Hatchery Creek. The hatchery is supplied from the Kalama River by pumping and by gravity flow from Fallert Creek (Note: Hatchery Creek and Fallert Creek are different names for the same creek). Average use is 10,000 gpm with the Kalama River pumps supplying a nearly constant 6,000 gpm and Fallert Creek the remaining water.

Fallert Creek is used for incubation and some fish rearing. It is unused during summer months due to low flows. A new intake on the creek has just been completed and should increase the amount of usable water during winter months.

The raceways and gravel pond receive single pass water. The

asphalt rearing pond receives approximately 1,500 gpm re-use water from the gravel pond out of a total flow of about 3,000 gpm.

### Current Production Constraints

Available flow to hatchery is limiting production of yearling fish. An increase in the water supply would also allow fall chinook to be reared to a larger size.

Fallert Creek is reduced to practically nothing in the summer and fall.

Incubation water is supplied from Fallert Creek and is not the best quality. Trays and deep troughs are used as sediment settling basins. Shallow troughs need to be replaced with vertical incubators.

Late summer water flows are low and temperatures 55 to 62 degrees fahrenheit. Adult holding losses are as high as 20%. During years of egg shortages these adults are needed to maintain production levels.

### Theoretical Production

Theoretical production based on the flow method is 109,791 pounds and with density is 314,190 pounds. Average production was 80,876 pounds and the 1987 agency goal was 67,810 pounds. The current agency goal is 108,000 pounds and includes spring chinook which the 1987 goal did not include. Theoretical calculations were calculated as follows:

#### Flow Method \*

Spring Chinook:	1.98 X 3,000 gpm X 6.92"	=	41,105 lbs	
Fall Chinook:	1.98 X 2,500 gpm X 3.46"	=	17,127 lbs	
	1.98 X 3,000 gpm X 3.46"	=	20,552 lbs	**
Coho:	1.98 X 3,000 gpm X 5.22"	=	<u>31,007 lbs</u>	**
			109,791 lbs	

#### Density Method \*

Spring Chinook:	.3 X 55,000 cu ft X 6.92"	=	114,180 lbs	
Fall Chinook:	.3 X 55,000 cu ft X 3.46"	X 2pds=	114,880 lbs	**
Coho:	.3 X 55,000 cu ft X 5.22"	=	<u>86,130 lbs</u>	**
			311,190 lbs	

\* There are only two 55,000 cubic foot rearing ponds at this station. The agency double crops each of the ponds and theoretical calculations use each pond twice. If ponds were used only once then theoretical calculations would only be about half the poundages listed above. The eight raceways (51,200 cubic feet) were not used in theoretical

calculations as no **smolts** are released from them. There are two year classes of coho held on station and the following years smolts are utilizing raceways for the time period when theoretical production was calculated. If all raceways and the two rearing ponds were used only once in calculations, then theoretical production would be about 65% of the figures listed above.

- \*\*** These ponds are supplied with up to 50% re-use water and normal hatchery practice would be to produce only about half the poundage of a single pass water system.

Based on comparison of the 2 theoretical calculations it appears that flow is the limiting factor in production. Average production and the 1987 agency goal are both less than theoretical flow calculation, but does not factor in that some ponds receive re-use water or that the two rearing ponds are double cropped.

The current agency goal can only be achieved by two smolt releases from each rearing pond per year (double cropping). This facility is not capable of holding at any single point in time the pounds listed under the current agency goal.

#### Hatchery Expansion Capability

The hatchery is situated on 19 acres owned by WDF. Approximately 70% of the property is being utilized. There is room across the county road for a single half acre rearing and release pond. Additional water from the Kalama River is available year round. A new intake has just been completed on Fallert Creek and should result in additional water during winter and spring months. There is no ground water available at this site.

Construction of a half acre rearing/release pond between the county road and Kalama River is proposed. This pond would need to be supplied with a minimum of 4,488 gpm (10 cfs) which is available, but would require pumping from the Kalama River. It is estimated that 600,000 to **1,000,000** yearling coho weighing 40,000 to 66,667 pounds could be reared. Additional incubation and starter ponds may also be required. For purposes of this report, the smaller numbers and pounds identified above are used in tables.





Lyons Ferry Salmon Hatchery  
Box 175  
Starbuck, Wa. 99359

Funding Agency: COE, USFWS  
Species Reared: Fall Chinook  
Spring Chinook

Manager: Carl Ross  
Phone #: (509) 646-3474

## Introduction

Lyons Ferry Salmon Hatchery is located adjacent to the confluence of **Palouse** and Snake Rivers about 7 miles west of Starbuck. This facility is operated as a complex with the WDW hatchery also located at this site. The spring chinook acclimation pond at Tucannon Hatchery (WDW facility) is operated as a satellite facility. The hatchery began operation in 1984. It was constructed under the Lower Snake River Compensation Program (LSRCP) as mitigation for Federal dams constructed on the lower Snake River. The facility is staffed with 5.25 **FTE's**.

The rearing units are in good condition and consist of 28 raceways and two rearing ponds. The raceways were not designed to allow direct liberation into the Snake River so **smolts** must be trapped and transported prior to release. All eggs are incubated in vertical incubators and the resulting fry are **ponded** directly into raceways.

Spring chinook from the Tucannon River are trapped and spawned at the WDW Tucannon Hatchery. Eggs are shipped green to Lyons Ferry Salmon Hatchery where they are fertilized and incubated. The resulting fry are **ponded** into 2 raceways beginning in November. Pond splits occur sometime in July after the fall chinook have been released and now occupy 10 raceways. In November they are collected and transferred to the pond at Tucannon Hatchery for final rearing, acclimation, and release the following April. The WDW staff feed fish while they are in the acclimation pond. Lyons Ferry Hatchery is credited for the releases and they are reported on in this section of the report.

Fall chinook adults return to the hatchery or are trapped at Ice Harbor Dam. Eggs are taken at the hatchery and fry **ponded** in raceways beginning in January. Raceways are split in April and up to **1,000,000** fish put into each of the large rearing ponds. Approximately 450,000 are also held in raceways for a yearling release. Yearling smolts are released in April and rearing ponds are liberated during summer.

Water rights total 53,200 gpm from wells and are held jointly with the WDW hatchery. (According to WDW data, 27,000 gpm is identified for use by WDF at their hatchery.) Water is pumped into a holding tank and gravity flow is provided to rearing units from there. No river water is currently being utilized. Water is not normally re-used, but there is the capability of re-using water from the upper

bank of raceways to the lower bank if needed.

### Current Production Constraints

Additional well water is needed during high demand periods (spring). Currently all pumps run during this peak time which leaves no backup pump if mechanical problems occur. Manganese in well water supply causes problems.

Hatchery was designed for 90 day fall chinook production. Currently both zero age and yearling **smolts** are produced. There is no place to split the 0+ fall chinook until yearlings have been released in April. Consequently, some overcrowding is occurring and feed levels are reduced to restrict growth until after the April yearling release frees up pond space.

Fish can not be released from raceways directly to the river. Two, half acre release ponds are needed to allow direct release of **smolts** now held in raceways. No increase in production would result, but this would help to produce better quality smolts.

Currently, adult escapement to the hatchery limits production.

Adult holding and spawning setup is inefficient. Fall back channel doesn't work. With fish in channel and in ponds there is no place to sort. The system has worked only because adults have not begun returning in large numbers.

### Theoretical Production

Theoretical production based on the flow method is 285,801 pounds and with density is 303,190 pounds. The theoretical production at the Tucannon Hatchery salmon acclimation pond for flow is 20,318 pounds and with density is 14,020 pounds and is included in numbers above. Average releases were 75,509 pounds and the 1987 agency goal was 64,500 pounds (includes fall chinook and spring chinook). Spring chinook releases from the Tucannon acclimation pond are credited to Lyons Ferry and reported in this section of the report. The current agency goal is 72,800 pounds of which 8,800 pounds is spring chinook. Theoretical calculations were computed as follows:

Flow Method \*

Fall Chinook:

Yearlings	1.67	X	3,000	gpm	X	7.45"	X	2	pds	=	74,649	lbs
	1.67	X	880	gpm	X	7.45"	X	8	raceways	=	87,588	lbs
Zeros	1.67	X	3,000	gpm	X	3.22"	X	2	pds	=	32,264	lbs
	1.67	X	880	gpm	X	3.22"	X	15	raceways	=	70,982	lbs

Spring Chinook:	1.5	X	2,250	gpm	X	6.02"	=	20,318	lbs
.(Tucannon)								285,801	lbs

Density Method \*

Fall Chinook:

Yearlings	.3 X 30,000 cu ft X 7.45" X 2 ponds =	134,100 lbs
	.3 X 3,000 cu ft X 7.45" X 8 raceway=	53,640 lbs
zeros	.3 X 30,000 cu ft X 3.22" X 2 ponds =	57,960 lbs
	.3 X 3,000 cu ft X 3.22 X 15 raceway=	43,470 lbs

Spring Chinook:	.3 X 7,763 cu ft X 6.02"=	<u>14,020 lbs</u>
(Tucannon)		303,190 lbs

- \* The 2 large rearing ponds are used twice in theoretical calculations, once for yearling releases and once for zero age releases. Agency is double cropping these ponds. If they are only used once in calculations theoretical flow would equal about 211,152 pounds and density would equal 169,090 pounds.

Only 23 out of the 28 raceways are utilized in calculations. The remaining raceways are being utilized to hold the fingerling fish for next years yearling releases, so were not used.

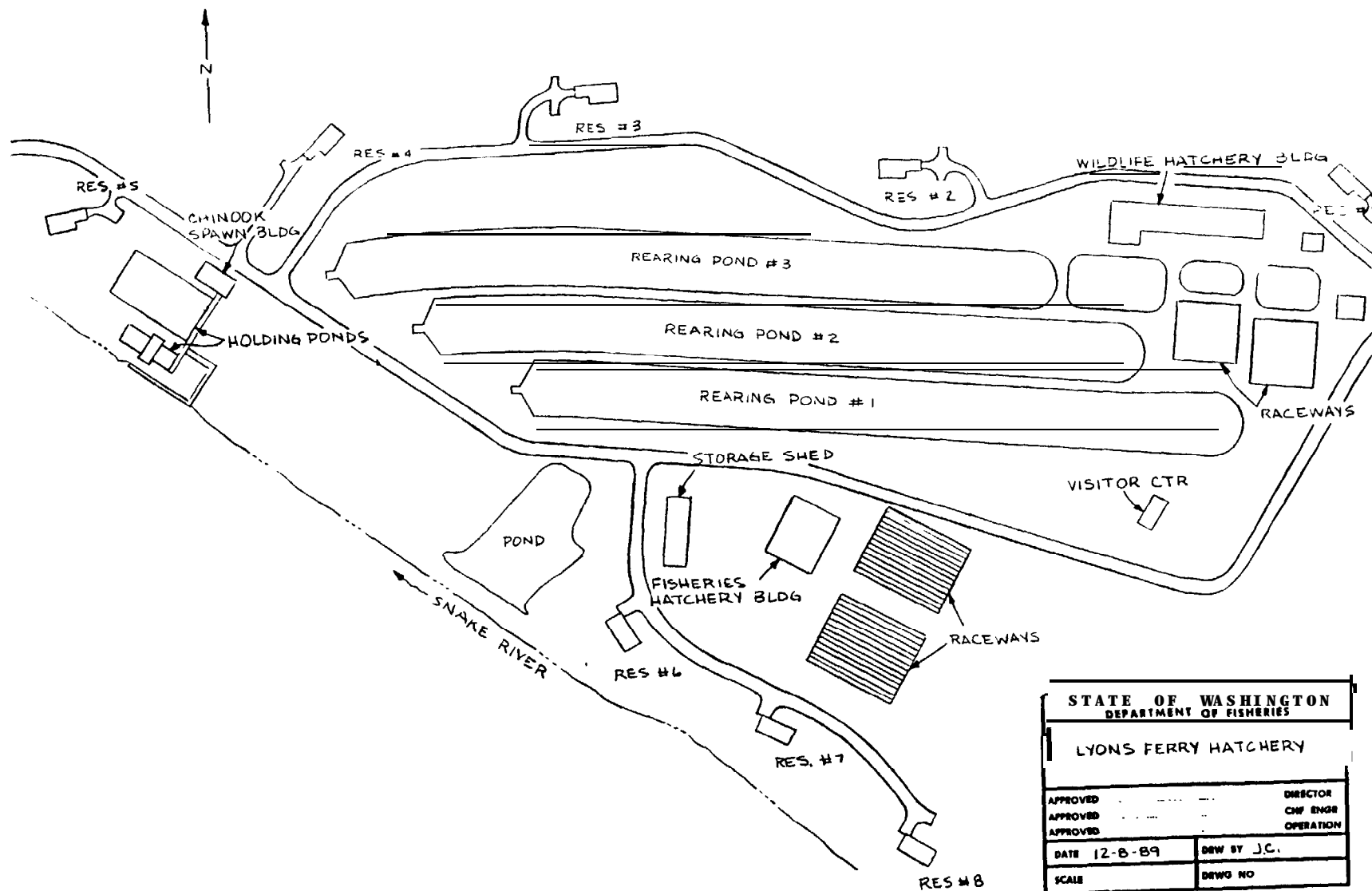
Comparison between the 2 theoretical calculations indicates that flow may be slightly limiting. The current adult escapement to the hatchery is limiting production so the average and agency goal figures do not indicate what this facility is capable of rearing.

### Hatchery Expansion Capability

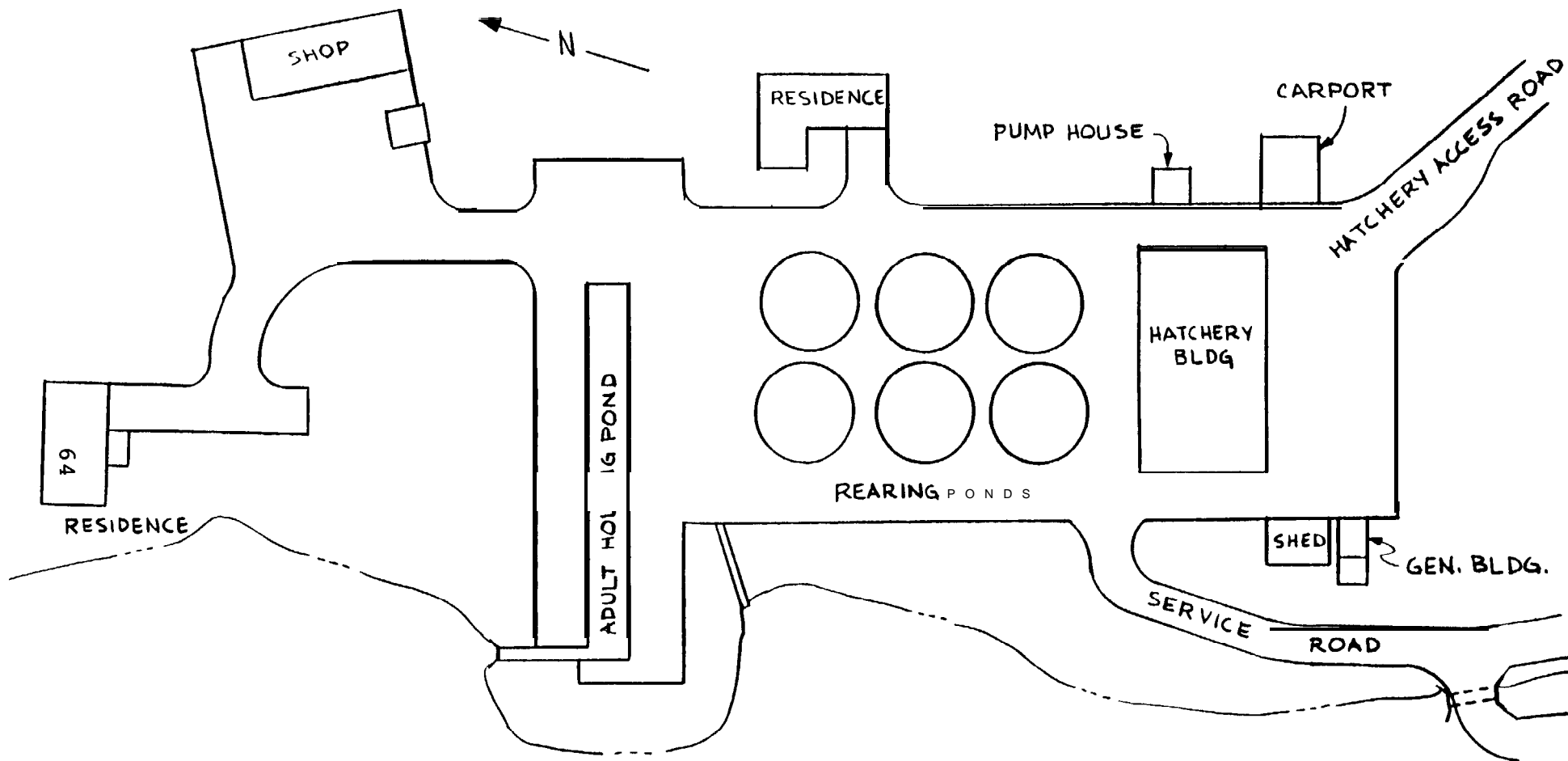
The WDF hatchery is situated on 20 acres owned by the U.S. Army Corp of Engineers (COE). Approximately 60% of the site is in use. The remaining property is suitable for expansion near the hatchery building. Water is available from the Snake River, but due to high water temperatures in summer and fall could only be used during winter and spring months. River water would also be a potential carrier of disease organisms and is generally not considered to be a good source. The potential for developing additional water from the existing well field is unknown.

Two, half acre release ponds each utilizing approximately 4,488 gpm (10cfs) are needed. These ponds would not increase production, but current smolt releases from raceways would occur there. Smolts in raceways currently cannot be released directly into the river, but must be trucked. These ponds would also ease pond splitting problems now occurring in the spring.

No hatchery expansion capability is identified.



STATE OF WASHINGTON DEPARTMENT OF FISHERIES	
LYONS FERRY HATCHERY	
APPROVED _____	DIRECTOR
APPROVED _____	CHIEF ENGR
APPROVED _____	OPERATION
DATE 12-8-89	DEW BY J.C.
SCALE	DEWG NO



STATE OF WASHINGTON DEPARTMENT OF FISHERIES			
		LYONS FERRY HATCHERY TUCANNON RIVER SATELLITE FACILITY	
DATE	12-8-89	APPROVED	DIRECTOR
DRAWN	CHUCK	APPROVED	CHIEF SWR
DESIGNED BY	JC	APPROVED	OPERATIONS
SCALE		PROJECT NO.	Sh. of

Priest Rapids Hatchery  
P.O. Box 937  
**Mattawa, Wa.** 99344

Funding Agency: Grant County PUD  
Species Reared: Fall Chinook

Manager: Paul Pederson  
Phone #: (509) 932-4481

## Introduction

Priest Rapids Hatchery is located adjacent to Priest Rapids Dam along the Columbia River. Elevation of the facility is 445 feet above sea level. The hatchery began operation in 1963 and originally was designed and constructed as a mile long spawning channel. The upper portion has since been converted into 6 large rearing ponds. The remainder of the channel is currently unused. The hatchery is staffed with 4.75 **FTE's**.

The rearing units are in good condition and consist of 6 large rearing ponds and 12 vinyl raceways. Only 5 of the rearing ponds are used for smolt production. The sixth pond is only used for adult holding.

Fall chinook is the only species reared. Mitigation agreement with Grant County PUD requires a production level of **100,000** pounds annually. The current production goal is to produce **6,500,000** smolts.

Adults are spawned during November and the resulting fry are ponded into the vinyl raceways. They remain there for only 2 weeks. Fingerlings are then transferred into the large ponds and reared until release, which is usually in June. The vinyls are also used to hold juveniles which are to be coded wire tagged or freeze branded.

No water rights were identified.

Water is supplied to the hatchery from 2 sources: the Columbia River and Wells. The majority of the water is supplied by gravity flow from the Columbia River (44,883 gpm) with the wells supplying 8,000 gpm. The river water is used in the large rearing ponds (6,500 gpm to each pond) and the well water is used for incubation and supplying the vinyl raceways. Water is not re-used at this facility, however 6,000 to 7,000 gpm could be re-used in the rearing ponds if required.

## Current Production Constraints

Production is limited due to budget constraints. Production could be increased by 50% to 100% with existing flow and facilities if budget allowed. The adult holding pond is not being utilized to rear smolts but could be.

Columbia River water gets very warm in summer/fall and is not be a good source for year round operation. It is also a potential source for importing disease organisms.

The hatchery is owned and funded by Grant County PUD and any change in production or expansion may need to be negotiated.

### Theoretical Production

Theoretical production based on the flow method is 172,480 pounds and with density is 171,281 pounds. These figures are only for the 5 rearing ponds used to rear smolts. The vinyl raceways and adult holding pond were not used in the calculations, but if added in would increase theoretical production to over 210,000 pounds. Average production was 121,495 pounds and the 1987 agency goal was 119,640 pounds (current goal is 125,000 pounds). Theoretical calculations were computed for fall chinook as follows:

#### Flow Method

$$1.22 \times 6,500 \text{ gpm} \times 4.35" \times 5 \text{ ponds} = 172,480 \text{ lbs}$$

#### Density Method

$$.3 \times 26,250 \text{ cu ft} \times 4.35" \times 5 \text{ ponds} = 171,281 \text{ lbs}$$

Comparison between the 2 theoretical calculation indicates that flow and pond space appear to be in balance. Production is set by mitigation agreement and budget is set accordingly. This facility could increase production significantly given additional funding.

### Hatchery Expansion Capability

The hatchery is situated on land owned by Grant County PUD. The majority of the old spawning channel is not being utilized. There is space for expansion on existing hatchery grounds, plus additional land owned by Grant County PUD suitable for fish culture operations is adjacent to the hatchery. It is unknown if Grant County PUD would allow hatchery expansion on this property.

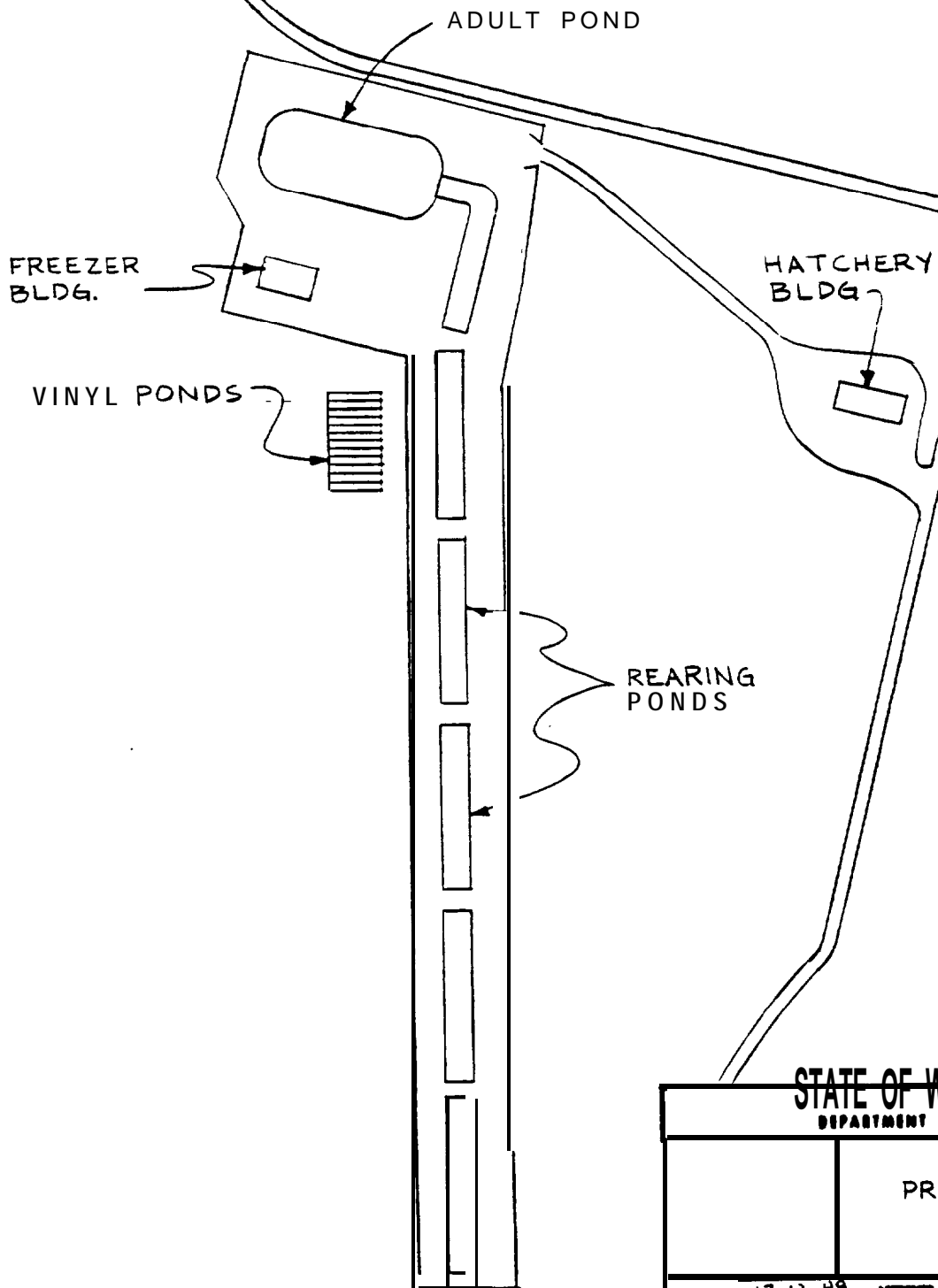
Additional water should be available from the Columbia River in virtually unlimited quantities, but is suitable only for short term zero age smolt production due to warm water temperatures in the summer. The potential for water from additional wells is unknown. If year round operation is to occur (to allow a yearling smolt program), it will require additional well water in summer/fall months.

As indicated by WDF, production could be increased 50% to 100% with existing water and pond space given adequate budget. For purposes



of this report we have assumed a 50% increase is possible and estimate **3,125,000** fall chinook **smolts** weighing 62,500 pounds could be produced given an adequate budget.

Most of the old spawning channel is not being utilized but could be developed into rearing ponds similar to the existing ponds which are 250' x 30' x 3.5'. A minimum of 10 additional spawning channel sections could be converted to rearing ponds. Each pond could produce a minimum of **1,000,000** fall chinook weighing 20,000 pounds. Each rearing pond would require 6,500 gpm of water. Additional incubation facilities would also be require and maybe more starter ponds.



STATE OF WASHINGTON	
DEPARTMENT OF FISHERIES	
PRIEST RAPIDS HATCHERY	
DATE 12-12-89	APPROVED _____
CHECKED _____	APPROVED _____
DESIGNED BY JC	APPROVED _____
SEAL _____	PROJECT NO. _____
Sht. of	

Ringold Springs Salmon Pond  
1871 Ringold River Road  
Mesa, Wa. 99343

Funding Agency: NMFS  
Species Reared: Fall Chinook

Manager: Frank Anderson  
Phone #: (509) 269-4448

### Introduction

Ringold Springs Salmon Pond is located adjacent to the Columbia River about 17 miles east of Mesa. Elevation of the site is 275 feet above sea level. The pond began operating as part of the CRFDP in 1963. It is staffed with 3 **FTE's**.

The facility is in good condition and consists of a 9 acre dirt rearing pond and 14 vinyl raceways. The raceways are only used to start fish and for early rearing. All smolt releases occur from the large rearing pond. There is no incubation facility. The high ammonia content in the water supply does not allow successful egg incubation.

Adult spring chinook and fall chinook have been trapped here in the past, but currently no adults are trapped at this facility. During this evaluation period only fall chinook **smolts** were produced. There was also some coho reared on an interim basis and transferred out. Currently, the production plan calls for rearing spring chinook.

Fingerling fall chinook from Priest Rapids Hatchery or spring chinook from Klickitat Hatchery are transferred in usually during January or February. Fingerlings are ponded at about 250,000 fish per vinyl raceway and are supplied with flows of 300 gpm each. Raceway flows are increased to a maximum 450 gpm as fish grow. Fish are transferred to the large rearing pond in August or September when juveniles are about 33 fish per pound. The smolts are released on-site the following April at a size of 6 to 8 fish per pound. Some interim rearing for other facilities is sometimes done in the vinyl raceways after fish are transferred to the rearing pond.

Water rights total 31,417 gpm (17,953 gpm has not been developed) from Ringold Springs. About 13,464 gpm of this water right is shared with the WDW Ringold Springs Steelhead Pond. A 30 inch and 18 inch diameter pipeline supply water to the vinyl raceways and rearing pond with a constant 60 degree fahrenheit temperature. The water delivery system can supply a maximum 8,300 gpm. Of this, 6,300 gpm can be supplied to raceways or the entire amount can be used in the rearing pond. Water supplied to raceways can be re-used in the rearing pond.

Plans have been developed to deliver an additional 2,200 gpm of Columbia River water to the rearing pond for acclimation/homing.

This was accomplished in 1990.

### Current Production Constraints

The 9 acre rearing pond is too big to fully utilize pond space. glow patterns are not uniform and plant growth in ponds is major problem in summer. Low dissolved oxygen problems in the spring just prior to release have occurred in the past.

If pond needs treatment for a disease problem it is expensive and nearly impossible to get uniform coverage.

Bird predation is a problem in rearing pond.

Additional flow to rearing pond is needed. Additional water supplied to the rearing pond could increase production and help eliminate the low dissolved oxygen problem in the spring. Approximately 30 cfs of Columbia River water supplied to rearing pond would aid in acclimation of smolts.

There are no incubation facilities due to the high ammonia content in water supply. It would be desirable to provide incubation facilities, however there may be no suitable water supply.

Existing adult holding pond is too small.

Hatchery land is owned by the Bureau of Reclamation (BR) and is leased to WDF. Modifications to the site would probably need to be negotiated with BR.

### Theoretical Production

Theoretical production based on the flow method is 79,231 pounds and with density is 652,747 pounds. These figures are for the rearing pond only and do not use the vinyl raceways in the calculations since no smolts are produced in them. The average production was 196,433 pounds and the 1987 agency goal was 137,500 pounds. Theoretical calculations were computed as follows:

#### Flow Method

Chinook:  $1.29 \times 8,300 \text{ gpm} \times 7.4" = 79,231 \text{ lbs}$

#### Density Method

Chinook:  $.03 \times 2,940,300 \text{ cu ft} \times 7.4" = 652,747 \text{ lbs}$

Comparison between the 2 theoretical calculations indicates that flow appears to be limiting factor in production. Additional flow could be used in rearing pond, but production based on the density

formula is not achievable. Using the 1987 production goal, a density index of .006 is currently being used for this pond. Additional water rights are held but construction of intake and enlarging or replacing the current plumbing is required to utilize it.

#### Hatchery Expansion Capability

The facility is situated **on 30** acres owned by the BR. The property is leased to WDF through the year 2001. Renewal of the lease is not considered to be a problem. Approximately 15% of the site is being utilized. A water right for 17,953 gpm of unused water is held by WDF. It would probably require pumping to supply the existing facility. In addition to the existing water right, an additional 24,686 gpm (55 cfs) of spring water is also available. There is some potential for water from deep wells, but the amount is not known and it may or may not be suitable for incubation. Columbia River water is available in large quantities but would not be suitable for used in summer and early fall. Using Columbia River water would aid in acclimation of smolts in the spring.

There is vast potential for expanding production at this facility. The available water could support significantly greater production than is now occurring. There is also room for additional rearing facilities. Although WDF is only proposing to increase flow into the existing pond to increase production, there may be additional expansion capability.

By increasing flow to 26,930 gpm (60 cfs) into the existing rearing pond, production could be increased over existing levels by 1,700,000 spring chinook weighing 212,500 pounds. This would provide a density index of .015 for the rearing pond. Water could be supplied from the springs or a combination of spring and river water. The water supply lines would need to be enlarged to supply the additional flow. Also, an additional 21 starter raceways would be required to support this production. Additional incubation facilities at Klickitat or another facility may also be required to handle the increased number of eggs.



Rocky Reach Hatchery  
Route 3, Box 3136  
East Wenatchee, Wa. 98802

Funding Agency: Chelan County PUD  
Species Reared: Fall Chinook  
Coho

Manager: Gary Osborne  
Phone #: (509) 663-8121

## Introduction

Rocky Reach Hatchery is located along the Columbia River on the east bank, just downstream from Rocky Reach Dam. Elevation of the site is 800 feet above sea level. The Turtle Rock Island facility is located 2 miles upstream and is operated as a satellite facility (It is shared with WDW). All smolt releases occur at Turtle Rock. Rocky Reach is an incubation and starting facility. Releases at Turtle Rock are credited to Rocky Reach and are reported in this section. The facility is staffed with 2.25 **FTE's**.

The rearing units are in fair to good condition and consist of 8 vinyl raceways at Rocky Reach and 4 rearing ponds of various sizes at Turtle Rock. The 4 ponds are arranged in a series. The WDW used the first pond during this evaluation and WDF used the remaining ones. The WDW production has since been transferred to the new East Bank Hatchery and is no longer being utilized.

Both URB fall chinook and lower river coho are reared. Eggs are normally transferred in from other hatcheries, incubated and started at Rocky Reach. Fingerlings are finally transferred to Turtle Rock ponds for final rearing and release. One pond reared coho and a second one reared fall chinook. During this evaluation period nearly all smolts were reared and released as yearlings.

Water rights are held by Chelan County PUD and total 3,613 gpm from the Columbia River. Water available for use in the Turtle Rock rearing ponds averages 12,000 gpm from 3 pumps on the Columbia River. Approximately 4,000 gpm per pond is currently being supplied to the 2 rearing ponds used by WDF. The Columbia River water is filtered and during emergencies it is possible to obtain by gravity flow up to 1,000 gpm for rearing ponds. The Rocky Reach facility is supplied with 1,800 gpm well water. Both ponds have separate supply and drain systems and utilize single pass water.

## Current Production Constraints

The Turtle Rock facility is located on an island. Access and fish transfers are by boat. Only 2 of the 4 ponds are being utilized.

At Rocky Reach, water temperature is too high for incubation and too low for fry starting. Soft shell has been a problem.

At Turtle Rock, high water temperatures occur during the summer.

Disease problems and low dissolved oxygen also occur at this time. Summer rearing conditions is limiting production potential.

This facility is dependent on other hatcheries for eggs. No adults are collected or spawned although the capability exists at Turtle Rock.

The hatchery and Turtle Rock satellite facility are owned by Chelan County PUD and operated as a mitigation facility. Production is set by mitigation agreement. Any change or increase in production may require negotiation with Chelan County PUD.

### Theoretical Production

Theoretical production based on the flow method is 73,486 pounds and with density is 128,695 pounds. Average production was 59,327 pounds and the 1987 agency goal was 50,000 pounds. Theoretical calculations were computed as follows:

#### Flow Method

Fall Chinook:	1.45 X 4,000 gpm X 7.45"	=	43,210 lbs
Coho:	1.45 X 4,000 gpm X 5.22"	=	<u>30,276 lbs</u>
			73,486 lbs

#### Density Method

Fall Chinook:	.3 X 33,858 cu ft X 7.45"	=	75,673 lbs
Coho:	.3 X 33,858 cu ft X 5.22"	=	<u>53,022 lbs</u>
			128,695 lbs

Note: Only 2 of the 4 rearing ponds are used in theoretical calculations. WDW is no longer using one pond and another pond is not being utilized. If all 4 ponds were used in calculations, the theoretical flow figure would increase by 1/3 (total flow of 12,000 gpm available) and the density figure would double.

Comparison of the 2 theoretical calculations indicates that flow may be limiting factor in production. High water temperatures and low dissolved oxygen levels during summer is definitely a constraining factor.

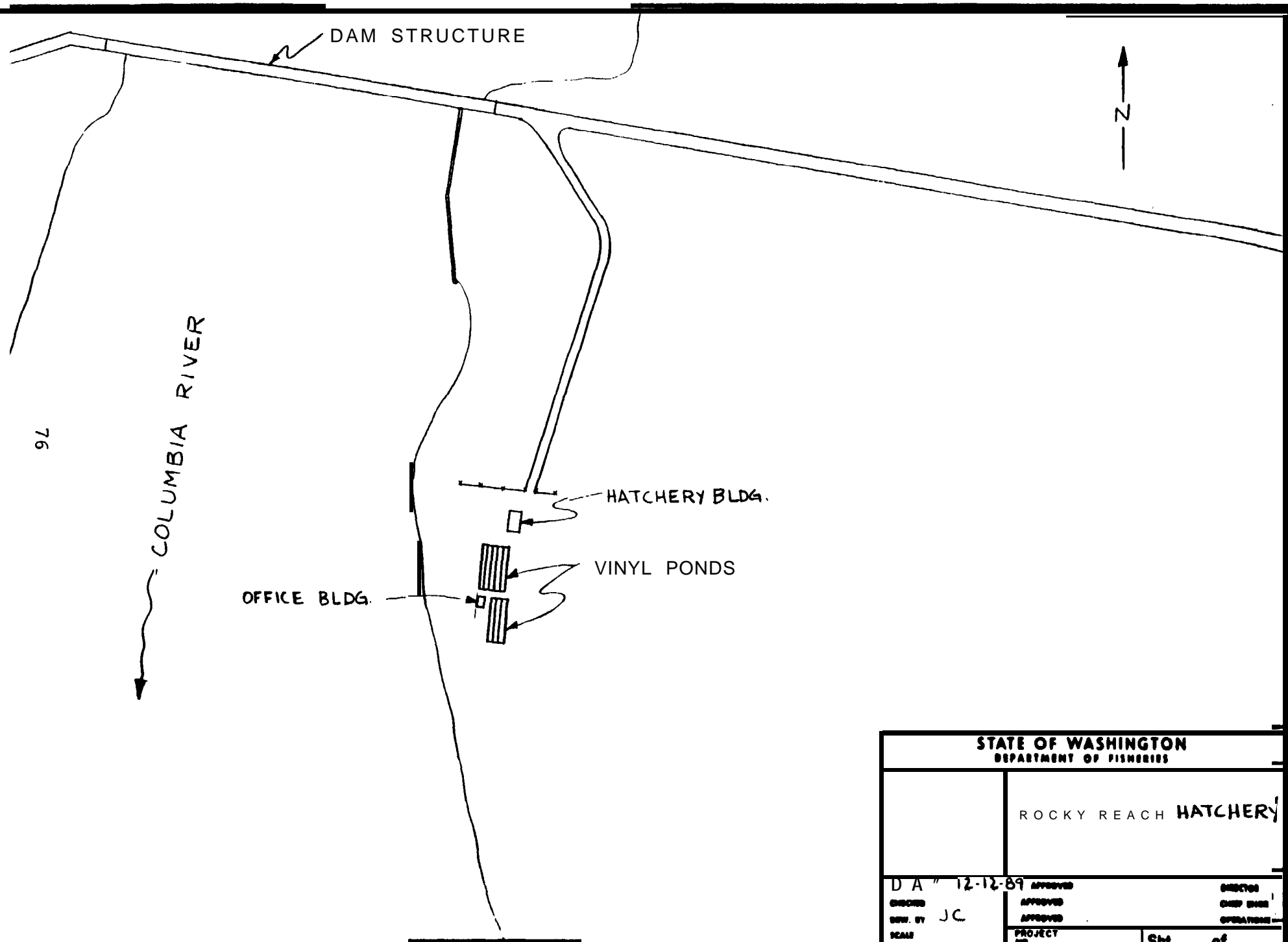
### Hatchery Expansion Capability

Turtle Rock is situated on an island and Rocky Reach on a small area below Rocky Reach Dam, both owned by Chelan County PUD. Approximately 10% of the area is being utilized. The lower **1/3** of the island is suitable for expansion. Large quantities of Columbia River water are available but quality during summer is poor and



there is high potential for importation of diseases if not treated.  
The potential for water from wells is not known.

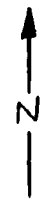
No expansion capability is identified.



76

COLUMBIA RIVER

DAM STRUCTURE



HATCHERY BLDG.

VINYL PONDS

OFFICE BLDG.

STATE OF WASHINGTON  
DEPARTMENT OF FISHERIES

ROCKY REACH HATCHERY

D A " 12-12-89

APPROVED

DIRECTOR

CHECKED  
BY JC

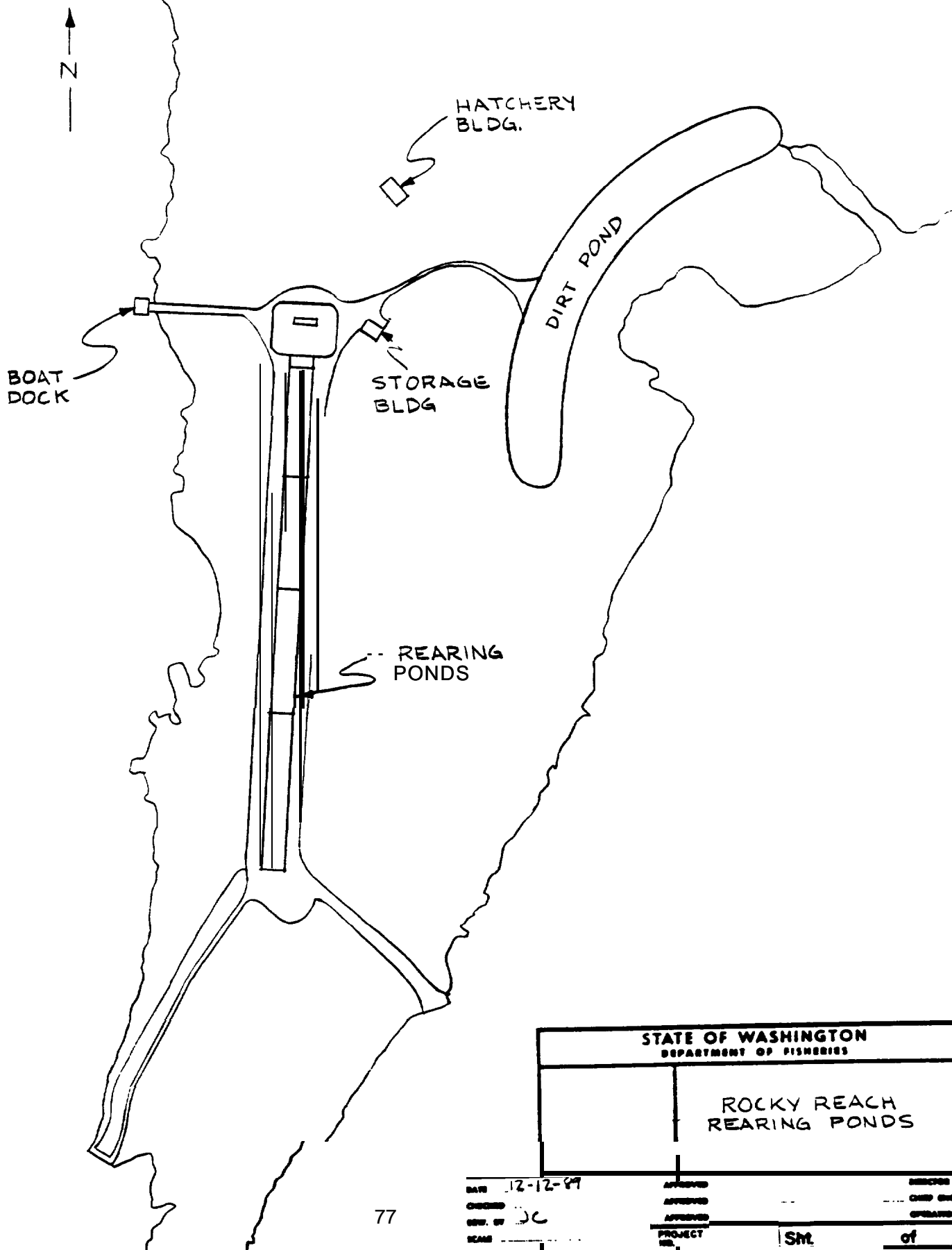
APPROVED

CHIEF ENGR

SCALE

PROJECT  
NO.

Sht. of



STATE OF WASHINGTON  
DEPARTMENT OF FISHERIES

ROCKY REACH  
REARING PONDS

DATE 12-12-89

DESIGNED

BY SC

SCALE

APPROVED

APPROVED

APPROVED

PROJECT

NO.

DIRECTOR

CHIEF ENGR.

OPERATIONS

SM

of

Toutle Salmon Hatchery  
No Address  
No Manager  
No Phone #

Funding Agency: WDF, NMFS  
Species Reared: Fall Chinook  
Coho

### Introduction

The Toutle Salmon Hatchery site is located along the Green River (Cowlitz Basin) about 23 miles east of Castle Rock. It is situated in a hilly location at 2,150 feet above sea level. The hatchery was authorized under the Mitchell Act and began operation as part of the CRFDP in 1956. The hatchery was destroyed in the May 18, 1980 eruption of Mount St. Helens.

Two large rearing ponds (Beaver Slough Rearing Ponds) near the hatchery site were only slightly damaged and subsequently were cleaned and have been operating since 1985. This program has steadily increased since then and the 1990 releases are estimated to be **2,500,000** fall chinook (31,300 pounds) and 800,000 coho (47,100 pounds). Personnel from the Cowlitz Hatchery operate this facility while the NMFS is currently paying for fish food.

The rearing units are in good condition and consist of 3 large dirt rearing ponds. Two of the ponds are used for hatchery operations and the third is used by WDF habitat management. Only operation of the 2 ponds used to rear fish are summarized in this report. The 2 ponds are essentially a single pond which has been divided in half. The destroyed Toutle Hatchery has not been rebuilt.

No adults are collected at this facility. Fall chinook and coho fingerlings have been transferred in from Grays River, Washougal, and Kalama Falls Hatcheries. Coho are reared to yearling and fall chinook as zero age smolts. Smolts are released on-site in the spring.

Water rights for Toutle Hatchery total 26,031 gpm from the Green River. These water rights are the ones held for operation of the hatchery prior to it being destroyed. Average flow available to the rearing ponds is 4,000 gpm. The ponds are designed to provide 9,000 gpm by gravity flow. Water is re-used from upper pond to lower pond.

### Current Production Constraints

Destroyed hatchery will need to be rebuilt to fully utilize the water right.

### Theoretical Production

Theoretical production based on the flow method is 146,853 pounds

and with density is 529,200 pounds. Average production was 13,088 pounds and the 1987 agency goal was 7,500 pounds. Production began in 1985 on an experimental basis to determine if the watershed had recovered enough to support fish culture. Production has increased each year since then, so averages and 1987 goal do not reflect what can be produced. The 1990 goal has been increased to 78,400 pounds. Theoretical calculations were computed as follows:

#### Flow Method

Fall chinook:	1.85 X 9,000 gpm X 3.6" =	59,940 lbs
Coho:	1.85 X 9,000 gpm X 5.22" =	<u>86,913 lbs</u> *
		146,853 lbs

#### Density Method

Fall chinook:	.3 X 200,000 cu ft X 3.6" =	216,000 lbs
Coho:	.3 X 200,000 cu ft X 5.22" =	<u>313,200 lbs</u> *
		529,200 lbs

\* Supplied with re-used water, normal hatchery practice would be to rear only half this poundage.

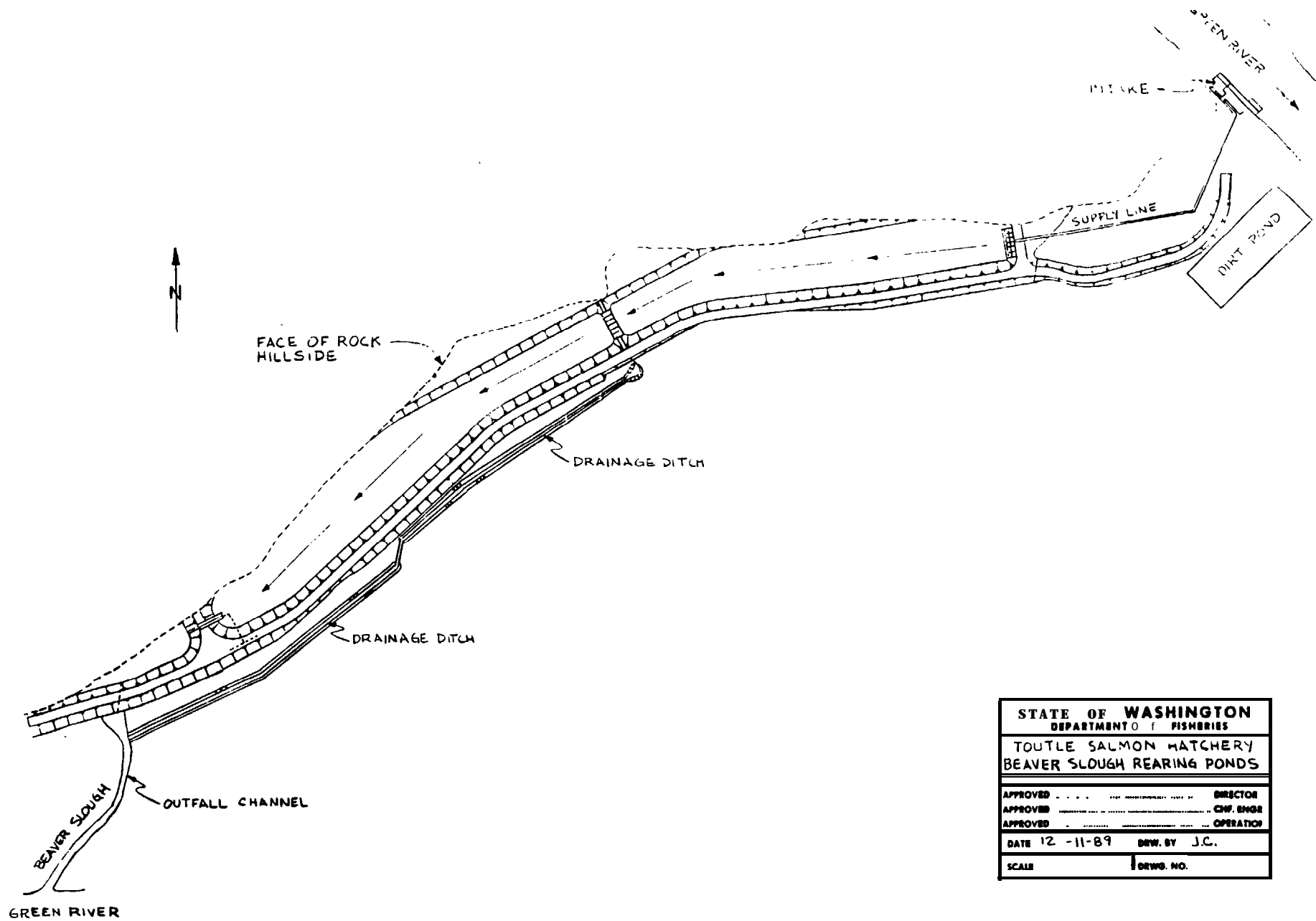
Comparison between the 2 theoretical calculations indicates that flow may be limiting although large rearing ponds such as these can not be expected to produce fish based on density factors. The agency used the raceway density index in calculations, but these ponds are not capable of rearing fish as efficiently as raceways. If the .03 density index is used in calculation, then the density figure would total 52,920 pounds. In reality, this pond is capable of rearing fish somewhere between the two density indexes used in this report. A density index of .044 is required to meet the current agency production goal.

### Hatchery Expansion Capability

The rearing ponds are situated on land owned by WDF. Only a small area is being utilized. An entire hatchery complex could be constructed on the site destroyed by the Mount St. Helens eruption. Possibly the intake and some of the plumbing from the destroyed hatchery could be salvaged. Water rights from the Green River are already held. There is no ground water available.

The water quality in the basin has improved to the point where the Toutle Hatchery could be reconstructed. The hatchery should be rebuilt using current technology. Production would be expected to equal pre-eruption levels of 3,000,000 fall chinook weighing 37,500 pounds and 1,400,000 coho weighing 93,000 pounds.

Renovation of the existing rearing ponds could produce an additional 500,000 yearling coho or spring chinook weighing about 33,333 pounds.



<b>STATE OF WASHINGTON</b>	
DEPARTMENT OF FISHERIES	
TOUTLE SALMON HATCHERY BEAVER SLOUGH REARING PONDS	
APPROVED	DIRECTOR
APPROVED	CH. ENGR.
APPROVED	OPERATOR
DATE 12-11-89	DRW. BY J.C.
SCALE	DRWS. NO.

Washougal Salmon Hatchery  
5.85 Washougal River Road  
Washougal, Wa. 98671

Funding Agency: NMFS  
Species Reared: Fall Chinook  
Coho

Manager: Dick Johnson  
Phone #: (206) 837-3311

### Introduction

The Washougal Hatchery is located along the Washougal River about 16 miles north of the town of Washougal. Elevation of the site is 120 feet above sea level. The facility was authorized under the Mitchell Act, constructed in 1958, and began operating in 1959. The facility is staffed with 5.25 **FTE's**.

The rearing units consist of 24 raceways (in good condition) and 3 dirt rearing ponds (in fair condition). The asphalt lined adult holding pond is not used for fish rearing.

Adult fall chinook and coho both are collected and spawned. The incubation system can handle up to 8,000,000 chinook and more than 4,000,000 late coho eggs. Using vertical incubators supplied with approximately 5 gpm each, 10,000 chinook eggs can be held to the eyed stage per tray and 7,500 from eyed to hatch. Coho can be held at 15,000 eggs per tray to eyed stage and 10,000 from eyed to hatch. Fall chinook are released on-site as zero age smolts. Coho are released as yearling smolts with 500,000 on-site and 2,500,000 trucked for release into the Klickitat River.

Water rights total 15,061 gpm from 4 sources: Washougal River, Bobs Creek, Boyle Creek, and Unnamed Spring. The intake on Bobs Creek is located 100 feet above the hatchery and water from it is used to turn turbines that pump Washougal River water which supply the raceways. An average of 8,500 gpm is available from the first 3 sources listed above. In addition, "**C**" Creek (unnamed spring water right) is used to hose down spawning area and during fish transfers (supplies 25 - 150 gpm).

Ponds (raceways) 1 - 12 are each supplied with 290 gpm of 75% Washougal River water and 25% Bobs Creek water. Ponds (raceways) 13 - 24 are supplied with 320 gpm of Washougal River and Boyle Creek water. Dirt ponds 25 and 26 are supplied by gravity flow from Boyle Creek. These ponds are only used in March and April and fingerlings are transferred to pond 27 for final rearing after coho have been released. Pond 27 (Lagoon Pond) uses water from Boyle Creek and re-use water from both banks of raceways.

### Current Production Constraints

Dissolved oxygen problems with coho in pond 27 occur in the spring. These fish are on re-use water, are subject to critical low

dissolved oxygen at times, and feed must be reduced or withheld with the ultimate result being smaller **smolt** size. Fall chinook also have the same problem of low dissolved oxygen and flows. An oxygen supplementation system would help eliminate this problem.

In the fall, water for incubation is supplied by reducing flow to ponds 1 - 12.

Raceways are designed to utilize 600 to 650 gpm of water but are supplied with about half of that flow. Production could be increased in existing raceways if additional water was provided.

There is a lack of adequate release facilities from raceways during low river flows.

### Theoretical Production

Theoretical production based on the flow method is 128,190 pounds and with density is 246,899 pounds. Ponds 25 and 26 and 11 raceways were not used in theoretical calculations because no smolts are produced in them. Two year classes of coho are being held on station at time theoretical calculations were computed and fingerlings are taking up pond space. Also, ponds 25 and 26 are only used a short time to hold fall chinook until they can be transferred to pond 27 after coho smolts have been released. Average production was 247,149 pounds and the 1987 agency goal was 219,414 pounds. The current agency goal is 236,300 pounds. Theoretical calculations were computed as follows:

#### Flow Method

##### Fall Chinook

Pond 27, 1.36 X 8,000 gpm X 3.46"	= 37,645 lbs *
6 raceways, 1.29 X 280 gpm X 4.36" X 6	= <u>9,449 lbs</u>
	47,094 lbs

##### Coho

Pond 27, 1.55 X 8,000 gpm X 5.0"	= 62,000 lbs *
7 raceways, 1.55 X 320 gpm X 5.5" X 7	= <u>19,096 lbs</u>
	81,096 lbs

Total	128,190 lbs
-------	-------------

#### Density Method

##### Fall Chinook

Pond 27, .03 X 420,000 cu ft X 3.46"	= 43,596 lbs *
6 raceways, .3 X 5,000 cu ft X 4.36" X 6	= <u>39,240 lbs</u>
	82,836 lbs

##### Coho

Pond 27, .03 X 420,000 cu ft X 5.0"	= 63,000 lbs *
7 raceways, .3 X 8,750 cu ft X 5.5" X 7	= <u>101,063 lbs</u>
	164,063 lbs

Total	246,899 lbs
-------	-------------



- \* Pond 27 is supplied with 90% re-use water and normal hatchery practice would be to rear only half this poundage. Also, this pond is used twice in theoretical calculations because WDF double crops from this pond. Coho smolts are release in early spring and then fall chinook are moved in from ponds 25 and 26 for a smolt release in June. If pond 27 is only used once in the calculations, theoretical production would be 90,545 pounds with the flow method and 203,303 with density.

Comparison between the 2 theoretical calculations indicates that flow is the limiting factor in production. Although average production is nearly equal to the theoretical density calculation, this is accomplished with re-use water and double cropping of pond 27. Dissolved oxygen levels are at critical low levels during much of the time fish are in pond 27 and feed has to be reduced or withheld at times. This is why smolt size in theoretical calculations is smaller for pond 27. The smaller smolt size could be affecting survival.

Ponds 25 and 26 are not used in theoretical calculations because they are used only 2 months out of the year. Fish in these ponds are moved to pond 27 for final rearing and release. Pond 27 is located downstream from the other 2 ponds on Boyle Creek and it is not desirable to have fish in all three ponds at one time.

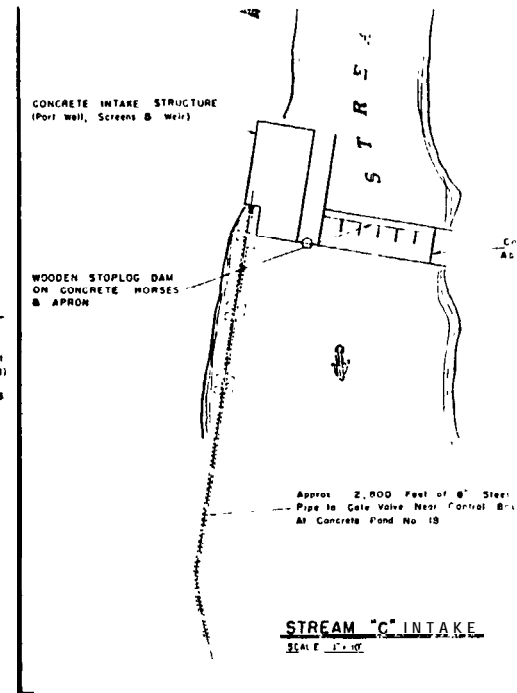
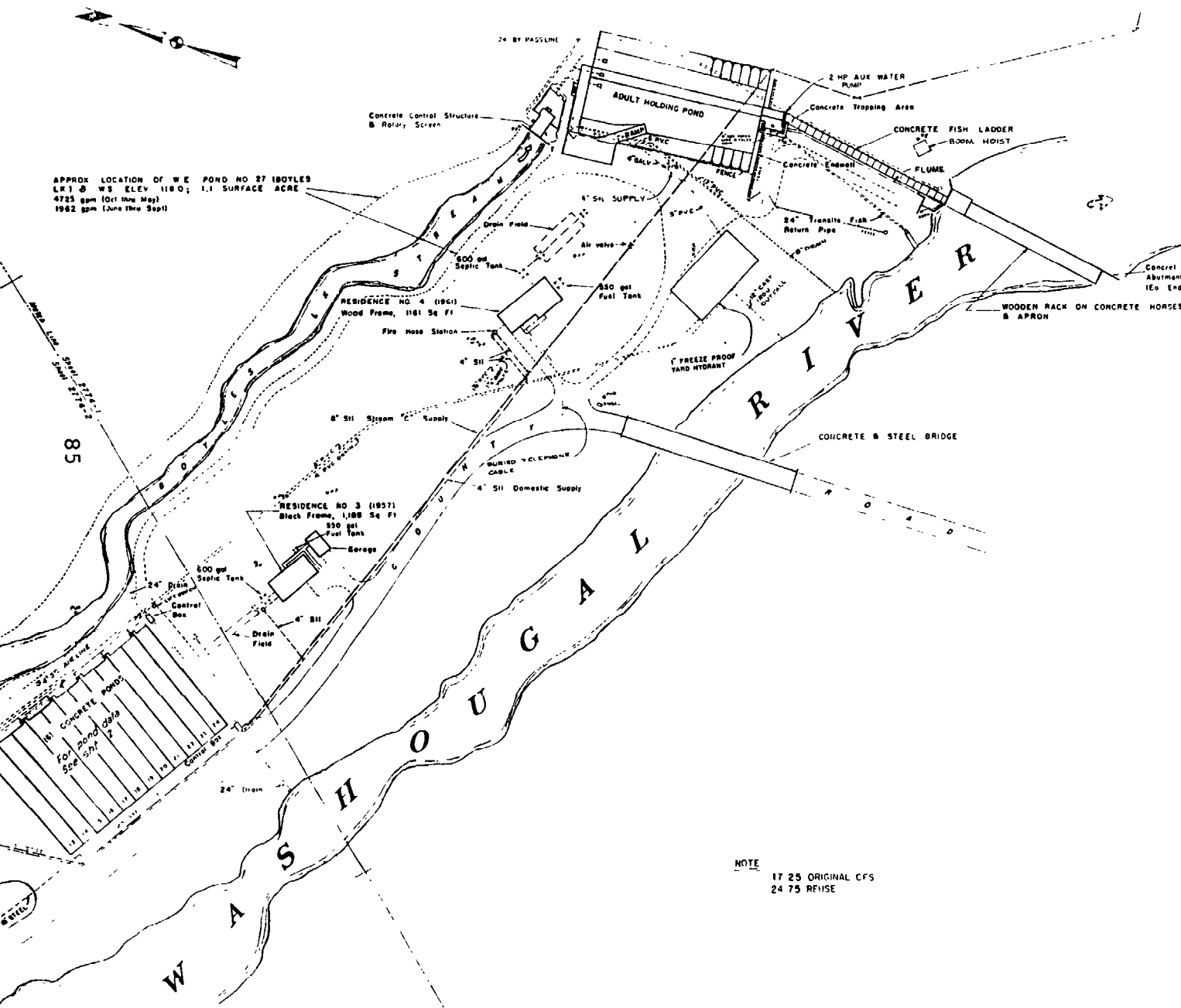
### Hatchery Expansion Capability

This hatchery is situated on 86 acres owned by WDF. Approximately 40% of the area is being utilized. There is a little land suitable for expansion. Additional water from the Washougal River is available in the spring, but requires pumping. There is no ground water at this site.

Additional water is needed in the spring. Installation of one or more pumps to supply additional water to raceways would allow an increase in production from existing raceways. Raceways are currently supplied with 280 to 320 gpm each when 600 to 650 gpm is needed to better balance with pond space. It is estimated that an additional 500,000 coho smolts weighing 33,333 pounds could be produced in existing raceways. This increased flow would also improve rearing conditions in pond 27, but would not increase production because it is already at carrying capacity based on density.

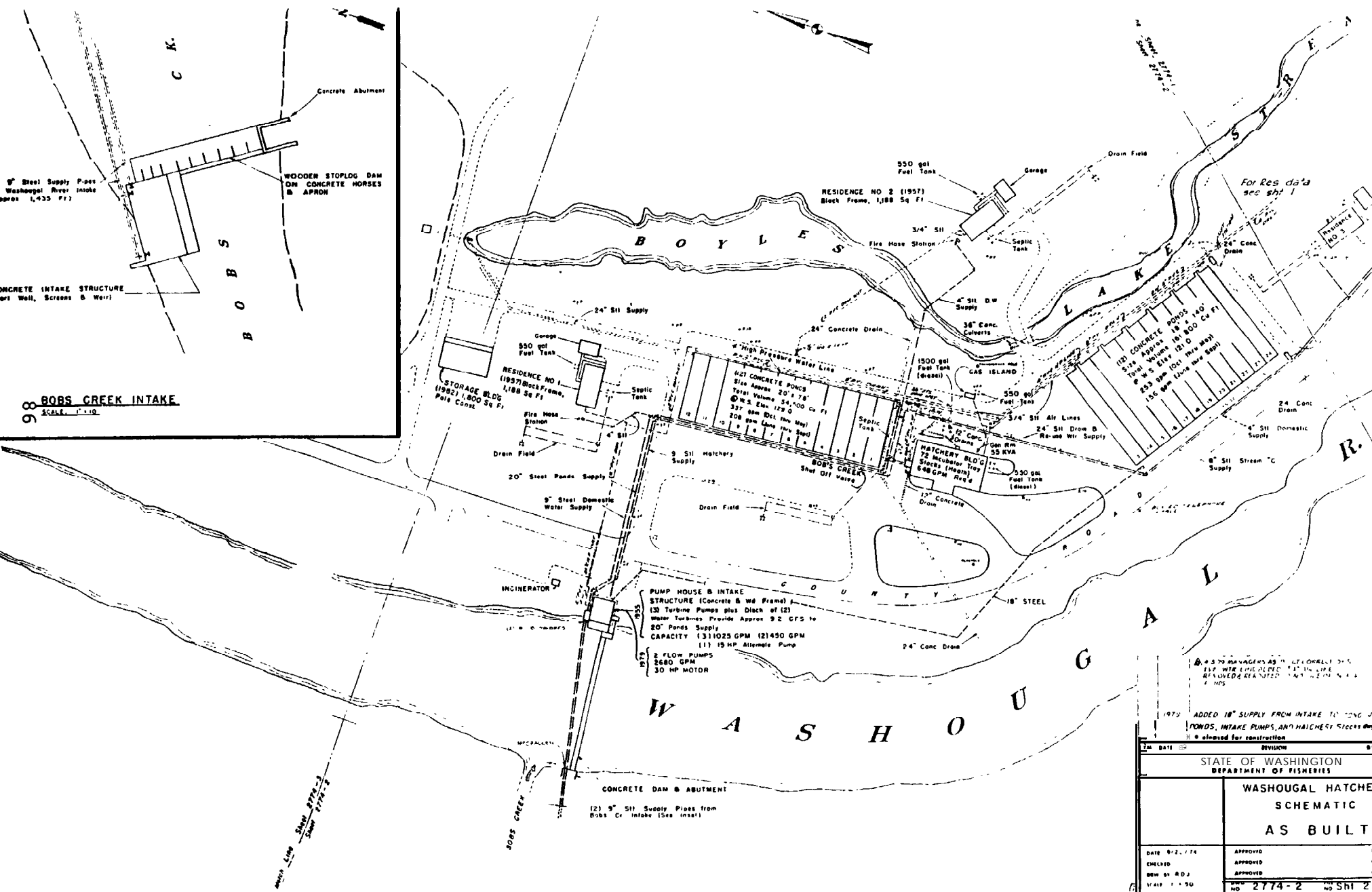
Net pens in **Camas** Slough in the lower Washougal River also has potential for expanding production. A small scale project of 2 net pens is proposed to determine if this site can successfully rear anadromous fish. If successful, a much larger net pen complex could probably be constructed. Production in the 2 net pens is estimated to be 100,000 coho or spring chinook smolts weighing

6,667 pounds. Cost is estimated at \$15,000 to \$18,000 per pair of net pens.



NOTE  
17.25 ORIGINAL CFS  
24.75 REUSE

1 - UPDATED	
Released for construction	
IN DATE	REVISION
STATE OF WASHINGTON DEPARTMENT OF FISHERIES	
WASHOUGAL HATCHERY SCHEMATIC AS BUILT	
DATE 8-22-74	APPROVED
CHECKED	APPROVED
DRAWN BY RDJ	APPROVED
SCALE 1" = 50'	FILE NO SHI 1



Wells Salmon Hatchery  
Box 3, Azwell Route  
Pateros, Wa. 98846

Funding Agency: Douglas County PUD  
Species Reared: Summer Chinook

Manager: Jerry Moore  
Phone #: (509) 923-2471

### Introduction

Wells Salmon Hatchery is located along the Columbia River at Wells Dam. Elevation of the site is 750 feet above sea level. The site, facilities, and water are shared with the WDW Wells Trout Hatchery. The facility is staffed with 3.7 **FTE's**.

The rearing units are in good condition and consist of 12 raceways, and 4 rearing ponds of varying sizes. Incubation capacity at the hatchery is **5,400,000** chinook eggs. Both zero age and yearling smolts are reared.

Water rights are held by Douglas County PUD and were not identified.

Water is supplied to the rearing facilities from 13 wells and Columbia River. Currently another well is being drilled. Well water is shared with WDW and not all wells can be used at same time. Average flow available is 34,111 gpm from Columbia River and 3,142 gpm from wells. A large portion of the Columbia River supply is used as attraction water which flows through the channel for adult capture and handling and is not used in the rearing ponds. Water from Columbia River is delivered by gravity flow.

Well water is re-used from raceways into adult steelhead holding pond and then into chinook adult holding/rearing pond.

### Current Production Constraints

The amount of available well water is limiting. Wells recently drilled have been dry. Not all wells can be used at same time. Well water is the only suitable source for adult holding during summer/fall months.

Adult holding ponds are supplied with re-use well water. There is room to incubate 5.4 million eggs.

Columbia River water is available in large quantities but is unsuitable for summer and fall periods due to high temperatures and importation of diseases.

Pond design does not allow convenient release of smolts directly into the river.

Water and facilities are shared with WDW and are not all available to WDF all the time.

Production is set by mitigation agreement with Douglas County PUD and any changes would have to be negotiated.

### Theoretical Production

Theoretical production based on the flow method is 99,801 pounds and with density is 127,566 pounds. Average production was 51,028 pounds and the 1987 agency goal was 62,630 pounds. The current goal is 66,400 pounds. Theoretical calculations were computed for summer chinook as follows:

#### Flow Method

2 Rearing Ponds,	1.55 X 4,950 gpm X 7.45"	=	57,160 lbs
1 Rearing Pond,	1.91 X 2,475 gpm X 3.8 "	=	17,964 lbs
1 Rearing Pond,	1.91 X 1,800 gpm X 3.8 "	=	13,064 lbs
4 Raceways,	1.91 X 400 gpm each X 3.8" X 4	=	<u>11,613 lbs</u>
			99,801 lbs

#### Density Method

2 Rearing Ponds,	.3 x 30,400 cu <b>ft</b> x 7.45"	=	67,944 lbs
1 Rearing Pond,	.3 X 18,300 cu ft X 3.8"	=	20,862 lbs
1 Rearing Pond,	.3 X 25,000 cu ft X 3.8"	=	28,500 lbs
4 Raceways,	.3 X 2,250 cu ft X 3.8" X 4	=	<u>10,260 lbs</u>
			127,566 lbs

Note: The 8 vinyl starter raceways **were** not used in calculations.

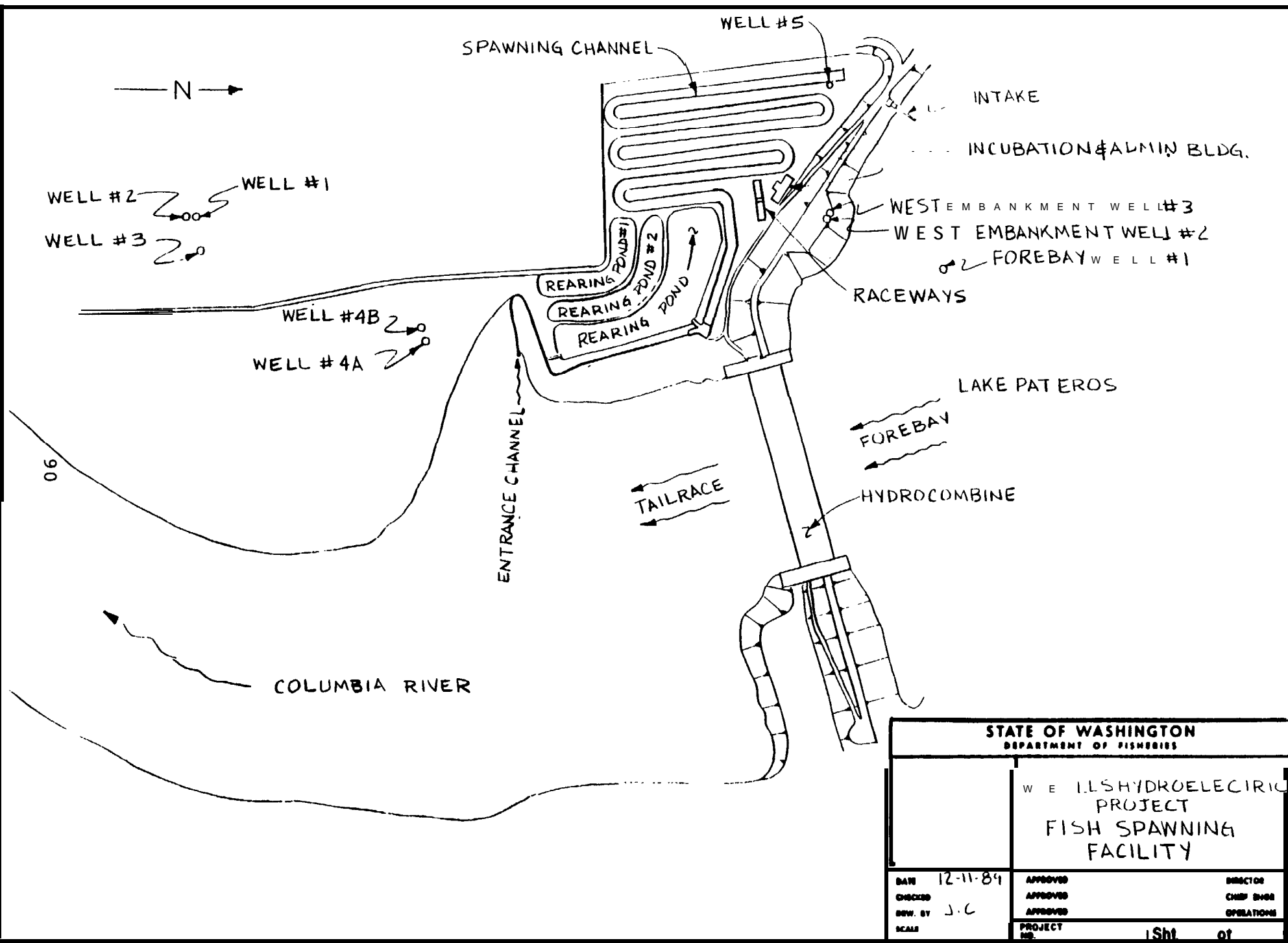
Comparison between the 2 theoretical calculations indicates that flow may be the limiting factor in production. The amount of well water limits pounds of fish which can be held on station throughout the summer and fall. The theoretical density figures used the raceway index in calculations, but these ponds are probably only capable of rearing fish at an index somewhere between a large rearing pond and raceway. Production based on the current agency goal requires a density index of about **.16**.

### Hatchery Expansion Capability

This facility is situated on 30 acres owned by Douglas County PUD and is part of the Wells Dam Hydro Project. Approximately 80% of the land is being utilized. Additional Columbia River water is available in large quantities but is not suitable for use during summer/fall months. It also is a potential source for importation of disease organisms and probably should be treated. Additional well water may be available, although recent attempts at drilling have produced dry holes.

There is land available near the mouth of the spawning channel for a half acre rearing/release pond which could utilize a minimum of 10 cfs re-use water from the hatchery. Potential production is estimated to be **1,600,000** summer chinook weighing 20,000 pounds. If a supply of fresh water could be provided then production could be about twice that level.

There is also some potential for one or more rearing/release ponds at the mouth of the Okanogan River about 10 miles north of the hatchery. The Okanogan River is not considered to be a usable water supply because of the wide temperature fluctuations from summer (too warm) to winter (to cold). The WDF indicates it would require ground water to operate any facility at this location. The potential for ground water is unknown so the potential production has not been quantified.



STATE OF WASHINGTON DEPARTMENT OF FISHERIES		
WEILS HYDROELECTRIC PROJECT FISH SPAWNING FACILITY		
DATE	12-11-89	APPROVED
CHECKED		APPROVED
DRAWN BY	J.C.	APPROVED
SCALE		PROJECT NO.
		DIRECTOR
		CHIEF ENGINEER
		OPERATIONS
		1 Sheet of



## LITERATURE CITED

- Piper, Robert G., Ivan B. **McElwain**, Leo E. **Orme**, Joseph P. **McCararen**, Laurie G. Fowler, and John R. Leonard. 1982. Fish Hatchery Management. United States Department of the Interior, Fish and Wildlife Service, Washington, D.C. 517 p.
- Washington, Dr. Percy, Survey of Artificial Production of Anadromous Salmonids in the Columbia River Basin. November 1985. Final Report Submitted to the Bonneville Power Administration, Contract No. DE-AI-7984BP17100, Project No. 84-51. Copies available from Bonneville Power Administration, Division of Fish and Wildlife, Public Information Officer - PJ, P.O. Box 3621, Portland Oregon 97208. 221 p.

Summary Tables  
For  
Washington Department Of Fisheries

Summary Table 1. List Of Hatcheries, Staffing Levels, And Operation And Maintenance Costs For All Facilities Operated By The Washington Department Of Fisheries Which Produce Anadromous Fish In The Columbia River Basin.

Hatchery	Staffing in <b>FTE's</b>	Operation and Maintenance Costs		
		1985	1986	1987
Cowlitz Salmon	13.83	320,822	399,244	837,505
Elokomin	4.33	252,876	217,055	232,108
Grays River	3.5	160,667	151,517	165,868
Kalama Falls	5.67	261,588	319,389	328,946
Klickitat	5.7	372,969	272,864	298,264
Lewis River	6.33	456,880	483,583	456,758
Lower Kalama	2.75	162,607	158,941	163,089
Lyons Ferry	5.25	302,502	303,395	370,370
Priest Rapids	4.75	251,939	291,626	243,556
Ringold Salmon	3.0	184,412	210,952	212,516
Rocky Reach	2.25	129,872	161,143	150,058
Speelyai	2.7	230,859	195,526	196,616
Toutle *		4,522		
Washougal	5.25	347,010	329,258	362,336
Wells	3.7	195,794	223,168	230,959
Weyco Pond *				

\* Toutle is operated by personnel from Cowlitz Hatchery and Weyco Pond is operated as a satellite of Grays River Hatchery.

Summary Table 2. The Initial Year Hatchery Operated, Land Available, Percent Land In Use, And Land Ownership For Hatcheries Operated By The Washington Department Of Fisheries Which Produce Anadromous Fish In The Columbia River Basin.

Hatchery	Initial Year of Operation	Hatchery Acres	Land Available % in Use	Land Ownership
Cowlitz Salmon	1967			Tacoma City Light
Elokomin	1954	39	90	WDF
Grays River	1961	15	80	WDF
Kalama Falls	1958	70	25	WDF
Rlickitat	1949			WDF
Lewis River	1932	119	25	WDF
Lower Kalama	1895	19	70	WDF
Lyons Ferry	1984	20	60	COE
Priest Rapids	1963			Grant County PUD
Ringold Salmon	1963	30	15	US Bureau of Rec.
Rocky Reach	1960		10	Chelan County PUD
Speelyai	1954	15	67	PP&L
Toutle	1956			WDF
Washougal	1959	86	40	WDF
Wells Salmon	1967	30	80	Douglas County PUD
Weyco Pond	1976	16	100	WDF

**Summary Table 3. List Of Existing Rearing Facilities For Each Hatchery Operated By The Washington Department Of Fisheries Which Produces Anadromous Fish In The Columbia River Basin. Figures For Length, Width, And Depth Are Listed In Feet And Volumes Are Given In Cubic Feet.**

Hatchery	Rearing Unit	Unit Length	Dimension Width	Depth	Unit Volume	# of Units	Total Volume	Construction Material	Rearing Age	Units Condition	Comments
<b>Cowlitz Salmon</b>											
	Heath Vertical Incubator					4,320		Fiberglas	22	Fair-Poor	Number of trays
	Kettles					18		Concrete	22	Good	
	Mdified Burrows Ponds				15,000	31	465,000	Concrete	22	Good	
	Mdified Burrows Ponds				11,000	5	55,000	Concrete	22	Good	For Adults
<b>Elokoni n</b>											
	Deep Troughs					12		Concrete	35	Good	
	Heath Vertical Incubator					576		Fiberglas	3	Good	
	Pond P21, .33 Acres			3	58,000	1	58,000	Dirt	35	Poor	
	Pond P22	160	100	4	64,000	1	64,000	Dirt	35	Good	
	Pond P23a	235	64	4	60,100	1	60,100	Asphalt	13	Good	Asphalted in 1981
	Pond P23b	235	64	5	75,200	1	75,200	Asphalt	13	Good	Asphalted in 1981
	Raceways	80	20	3	4,800	20	96,000	Concrete	35	Good	
	Shallow Troughs					6		Concrete	35	Good	
<b>Grays River</b>											
	Deep Troughs					32		Concrete	29	Fair	
	Heath Verticals					96		Fiberglas	12	Fair	
	Raceways	80	20	4.5	5,275	10	52,750	Concrete	29	Poor	
	Rear/Adult Pond	60	40	4.5	10,800	2	21,600	Concrete	29	Good	For adult holding
	Rearing Pond	200	55	4.5	49,500	1	49,500	Dirt	29	Poor	
	Shallow Trough					1		Concrete	29	Fair	
<b>Kalama Falls</b>											
	Heath Vert. Incubator					960		Fiberglas		Good	Individual Trays
	Raceways	80	20	3.5	5,600	12	67,200	Concrete	31	Fair-Good	Some ponds leak
	Rearing/Adult Ponds	60	40	5	12,000	6	72,000	Concrete	31	Fair-Poor	Ponds leak water
<b>Klickitat</b>											
	Deep Troughs					28		Concrete	40	Fair	252 sections
	F.A.L Vertical Incubator					64		Fiber./Plastic	1	Excellent	New
	Heath Vertical Incubator					96		Fiberglas		Poor	
	Pond P23	58	41	4	10,300	1	10,300	Concrete		Fair	Adult Holding Pond
	Pond P24, .41 Acres				82,800	1	82,800	Dirt		Poor	
	Pond P25, .43 Acres				80,213	1	80,213	Dirt/Vinyl Liner	6	Poor	Coho Release Pond
	Pond P26, .25 Acres				39,560	1	39,560	Dirt/Vinyl, Line	13	Poor	Wonder Springs Pd
	Raceways	100	10	3	3,000	22	66,000	Concrete	4	Excellent	
	Shallow Troughs					9		Concrete	40	Fair	108 baskets

Summary Table 3. Continue

Hatchery	Rearing Unit	Unit Length	Dimension Width	Depth	Unit Volume	# of Units	Total Volume	Construction Material	Rearing Age	Units Condition	Comments
<b>Lewis River</b>											
	.5 Acre Ponds				90,000	2	180,000	Concrete		Good	
	.5 Acre Ponds				80,000	2	160,000	Concrete		Good	
	Deep Troughs	15.5	1.5			5		Plastic	7	Good	
	F. A. L. Vert. Incubator					800		Fiberglas	7	Good	
	Raceways	100	10	4	4,000	12	48,000	Concrete	6	Excellent	
<b>Lower Kalama</b>											
	Deep Troughs					4		Concrete	40	Good	
	F. A. L. Vertical Incubator					304		Fiberglas	4	Good	Individual Trays
	Gravel Pond				55,000	1	55,000	Dirt		Poor	
	Heath Vertical Incubator					144		Fiberglas	20	Fair	Individual Trays
	Raceways	80	20	4	6,400	8	51,200	Concrete	29	Good	
	Rearing/Adult Pond				55,000	1	55,000	Asphalt	29	Fair	
	Shallow Troughs					16		Concrete	40	Good	Not for incubation
<b>Lyons Ferry</b>											
	Heath Vert. Incubator					1,792		Fiberglas	6	Good	
	Raceways	100	10	3	3,000	28	84,000	Concrete	6	Good	
	Rearing Pond	150	40	5	30,000	2	60,000	Concrete	6	Good	
<b>Priest Rapids</b>											
	Heath Vert. Incubator					1,280		Fiberglas	26	Fair	
	Raceways	80	8	2.5	1,600	12	19,200	Steel/Vinyl	3	Good	Starting fry
	Rearing Ponds	250	30	3.5	26,250	6	157,500	Concrete	26	Good	For Rearing/Adult
<b>Ringold Salmon</b>											
	9 Acre Rearing Pond			7.	2,940,300	1	2,940,300	Dirt	26	Good	
	Vinyl Raceways	83	8	2.5	1,660	14	23,240	Steel/Vinyl	13	Good	Liners replaced-84
<b>Rocky Reach</b>											
	Heath Vertical Incubator					128		Fiberglas	20	Fair	From Wells Hat.
	Raceways	80	8	2.5	1,600	8	12,800	Steel/Vinyl	20	Good	Liners need replaced
	Rearing Pond	148.5	254	4	37,719	1	37,719				Turtle Rock Pond
	Rearing Pond	148.5	228	4	33,858	2	67,716				Turtle Rock Ponds
	Rearing Pond	148.5	200	4	29,700	1	29,700	Concrete		Fair	Turtle Rock Pond

Summary Table 3. Continued

Hatchery	Rearing Unit	Unit Length	Dimension Width	Depth	Unit Volume	# of Units	Total Volume	Construction Material	Rearing Age	Units Condition	Comments
<b>Speelyai</b>											
	Adult Holding Pond	100	40	4.5	18,000	1	18,000	Asphalt	7	Fair	
	Deep Trough	15.5	1.5			1		Plastic		Good	12-15 gpm water
	F.A.L Vertical Incubator					500		Fiberglas	5	Good	
	Raceways	80	20	4.5	7,200	12	86,400	Concrete	20	Fair	
	Rearing Pond, .14 Acres				18,000	1	18,000	Asphalt	7	Fair	
<b>Toutle</b>											
	Pond	100	150	3.5	52,500	1	52,500	Dirt		Good	Used by Hab. Mgt
	Pond	400	100	5	200,000	2	400,000	Dirt		Good	
<b>Tucannon Salmon</b>											
	Rearing Pond	115	15	4.5	7,763	1	7,763	Concrete	4	Excellent	Spring Chinook pd
<b>Washougal</b>											
	Adult Holding Pond							Asphalt			
	Deep Troughs					4		Fiberglas	5	Good	Eyeing eggs only
	F.A.L Vertical Incubator					1,152		Fiberglas	5	Good	Individual Trays
	Pond P25, .3 Acres				100,000	1	100,000	Dirt	20	Fair	
	Pond P26, .3 Acres				120,000	1	120,000	Dirt	20	Fair	
	Pond P27, 1.1 Acres				420,000	1	420,000	Dirt	25	Fair	
	Raceways	80	20	3.1	5,000	12	60,000	Concrete	30	Good	
	Raceways	135	17.5	3.7	8,750	12	105,000	Concrete	30	Good	
	Shallow Troughs					2		Concrete	30	Good	
<b>Wells Salmon</b>											
	Heath Vertical Incubator					728		Fiberglas	20	Fair	
	Raceways	90	10	3	2,700	8	21,600	Steel/Vinyl	3	Good	
	Raceways	100	10	2.25	2,250	4	9,000	Concrete	20	Good	
	Rearing Pond	190	20	4	15,200	2	30,400	Concrete	20	Good	
	Rearing Pond	250	25	4	25,000	1	25,000	Concrete	20	Good	
	Rearing Pond	183	25	4	18,300	1	18,300	Concrete	20	Good	For Adult Holding
<b>Weyco Pond</b>											
	4 Acre Pond			5.4	940,900	1	940,900	Dirt		Good	

Note: Rearing unit volumes do not agree with dimensions in all cases due to rounding errors when converting inches to tenths of feet.

**Summary Table 4. Water Right Information And Water Available Which Delivery System Can Supply For Use At Each Hatchery Operated By The Washington Department Of Fisheries Which Rear Anadromous Fish In The Columbia River Basin.**

Hatchery Permit #	Water Source	Date	Water Right GPH	Water Available in GPM During Year			Comments
				Low Flow	High Flow	Average Flow	
<b>Cowlitz Salmon</b>							
8198	C-Wells		2,860	1,000	1,000	1,000	Incubation
14724	Cowlitz River		89,766			67,000	Fish Culture
8197	PW Wells		2,060	800	800	800	Fish Culture
			-----	-----	-----	-----	
		Total	94,686	1,800	1,800	68,800	
<b>Elokonin</b>							
	"A" Stream			10	1,500	600	Fish Culture
S2-09766C	Clear Creek	07/13/50	1,346	500	1,500	1,000	Fish Culture/Domest.
S2-09765C	Elokonin River	07/13/50	4,488	3,800	4,200	4,000	Fish Culture
S2-23234C	Elokonin River	10/04/74	898				Fish Culture
S2-23896C	Elokonin River	07/14/75	11,221	4,000	5,000	4,500	Fish Culture
S2-20553C	Elokonin River	10/13/72	790				Fish Culture
S2-09767C	Unnaned Stream	07/13/50	45				Fish Culture/Domest.
G2-03465C	Well	10/03/53	1,795				Domestic
			-----	-----	-----	-----	
		Total	20,583	8,310	12,200	10,100	
<b>Grays River</b>							
S2-16034C	Unnaned Stream	04/11/60	449				Domest/Fire Protection
S2-18878C	Unnaned Stream	02/23/65	2,693	449	898	673	Fish Cult/Incubation
S2-08674C	W.F. Grays River	01/11/49	7,967				Fish Culture
S2-23231C	W.F. Grays River	10/04/74	898				Fish Culture
S2-24858C	W.F., Grays River	03/28/78	8,977			4,488	Fish Culture
S2-08674C	W.F. Grays River	01/11/49	224				Domest/Fire Protection
001205	Well	01/01/61					Domestic
G2-21976C	Wells	02/20/74	1,280	975	973	975	Fish Culture
			-----	-----	-----	-----	
		Total	22,488	1,424	1,873	6,136	
<b>Kalama Falls</b>							
	Kalama River			5,000	6,000	5,500	Fish Culture
S2-18990C	Little Kalama River	07/03/56	3,591				Fish Culture
S2-18990C	Unnaned Creek	05/03/65	866				Fire Protection
S2-18989C	Unnaned Creek	05/03/65	1,315				Fire Protection
S2-18989C	Unnaned Creek	05/03/65	1,315	0	700	650	Fish Culture
S2-18990C	Unnaned Creek	05/03/65	31				Domestic
S2-18989C	Unnaned Creek	05/03/65	31				Domestic
S2-18990C	Unnaned Creek	05/03/65	866	0	500	500	Fish Culture
G2-24435C	Well	02/17/77	40				Domestic
			-----	-----	-----	-----	
		Total	8,055	5,000	7,200	6,650	



Summary Table 4. Continued

Hatchery	Water		Water	Water Available in GPW During Year			
Permit #	Source	Date	Right GPM	Low Flow	High Flow	Average Flow	Comments
Klickitat							
S3-22202C	Indian Ford Spr 1	12/07/73	5,386	5,500	5,500	5,500	Fish Culture
S4-28163C	Indian Ford Springs	02/22/83	31				Fish Culture
S4-07272C	Indian Ford Springs	06/19/46	6,732	2,600	2,600	2,600	Fish Culture
S4-28163C	Indian Ford Springs	02/22/83	31				Domestic
S4-27554C	Klickitat River	07/08/81	8,977	7,000	9,000	8,000	Fish Culture
S4-27553C	Unnamed Spring	07/08/81	1,795				Fish Culture
S4-01258C	Wonder Springs	04/01/53	5,386	5,100	5,100	5,100	Fish Culture
			-----	-----	-----	-----	
		Total	28,338	20,200	22,200	21,200	
Lewis River							
S2-02988C	Colvin Creek	05/22/30	2,693				Fish Culture
S2-23233C	Lewis River	10/04/74	898				Fish Culture
S2-02989C	Lewis River	05/22/30	2,693				Fish Culture
S2-24939C	Lewis River	05/26/78	26,930	10,000	30,000	22,000	Fish Culture
S2-18669C	Unnamed Stream	08/14/64	2,693				Fish Culture
S2-18669C	Unnamed Stream	08/14/64	2,693				Fish Culture
S2-21307C	Unnamed Stream	07/30/73	13				Domestic
			-----	-----	-----	-----	
		Total	38,613	10,000	30,000	22,000	
Lower Kalama							
S2-25509C	Hatchery Creek	03/03/80	5,386	0	8,000	4,000	Fish Culture
S2-21721C	Hatchery Creek	12/05/73	5,835				Fish Culture
S2-21710A	Kalama River	12/05/73	3,891	5,000	6,000	6,000	Fish Culture
000590	Well	01/01/70					Domestic
000589	Well	01/01/70					Domestic
			-----	-----	-----	-----	
		Total	15,112	5,000	14,000	10,000	
Lyons Ferry							
G3-26147C	Wells	01/27/79	27,000	29,930	29,930	29,930	Fish Culture
G3-26489C	Wells	12/06/79	26,200				Fish Culture
			-----	-----	-----	-----	
		Total	53,200	29,930	29,930	29,930	
Priest Rapids							
	Columbia River					44,883	Fish Culture
	Wells					8,000	Fish Culture
			-----	-----	-----	-----	
		Total	0	0	0	52,883	

Summary Table 4. Continued

Hatchery Permit #	Water Source	Date	Water Right CPM	Water Available in GPM During Year			Comments
				Lou Flow	High Flow	Average Flow	
<b>Ringold Salmon</b>							
S3-27816P	Ringold Springs	04/26/84	6,732				Fish Culture
S3-28301A	Ringold Springs	11/14/86	17,953				Fish Culture
S3-27815P	Ringold Springs	04/26/84	6,732	6,000	8,300	8,300	Fish Culture
000602	Well	01/01/68					Domestic
			-----	-----	-----	-----	
		<b>Total</b>	<b>31,417</b>	<b>6,000</b>	<b>8,300</b>	<b>8,300</b>	
<b>Rocky Reach</b>							
S3-21144C	Columbia River	05/11/73	22				Fish Culture
S3-21142C	Columbia River	05/11/73	3,591			12,000	Turtle Rock
	Well					1,800	Fish Culture
			-----	-----	-----	-----	
		<b>Total</b>	<b>3,613</b>	<b>0</b>	<b>0</b>	<b>13,800</b>	
<b>Speelyai</b>							
S2-10532C	Speelyai Creek	07/25/51	6,732	5,835	8,079	6,732	Fish Culture
			-----	-----	-----	-----	
		<b>Total</b>	<b>6,732</b>	<b>5,835</b>	<b>8,079</b>	<b>6,732</b>	
<b>Toutle</b>							
S2-24362C	Alder Creek	03/09/72	4,488				Fish Culture
S2-23796C	Green River	04/21/75	1,795				Fish Culture
S2-23797C	Green River	04/21/75	4,039				Fish Culture
S2-24831C	Green River	03/02/78	8,977		9,000	4,000	Fish Culture
S2-08904C	Green River	07/14/49	6,732				Fish Culture
			-----	-----	-----	-----	
		<b>Total</b>	<b>26,031</b>	<b>0</b>	<b>0</b>	<b>4,000</b>	
<b>Wishougal</b>							
S2-09760C	Bobs Creek	07/13/50	1,346				Domestic
S2-09760C	Bobs Creek	07/13/50	1,346	800	900	800	Fish Culture
S2-24444C	Bobs Creek	03/28/77	27				Domestic
S2-09762C	Boyles Creek	07/13/50	1,795	400	3,600	1,200	Fish Culture
S2-09761C	Unnamed Spring	07/13/50	673				Fish Culture
S2-25274C	Wishougal River	06/18/79	5,386				Fish Culture
S2-13405C	Wishougal River	03/11/55	4,488	1,000	6,500	6,500	Fish Culture
			-----	-----	-----	-----	
		<b>Total</b>	<b>15,061</b>	<b>2,200</b>	<b>11,000</b>	<b>8,500</b>	
<b>Wells Salmon</b>							
	Columbia River			8,977	78,545	34,111	Fish Culture
	Wells			449	5,386	3,142	Fish Culture
			-----	-----	-----	-----	
		<b>Total</b>	<b>0</b>	<b>9,426</b>	<b>83,931</b>	<b>37,253</b>	

Summary Table 4. Continued

Hatchery Permit #	Water Source	Date	Water Right GPM	Water Available in GPM During Year				Comments
				Low Flow	High Flow	Average Flow		
<b>Weyco Pond</b>								
S2-21949C	Alder Creek	02/20/74	4,713		8,977			Fish Culture
S2-24858C	Grays River	03/28/78	8,977					Fish Culture
R2-23731C	Grays River							Storage, 24 AF
			-----	-----				
		<b>Total</b>	<b>13,690</b>	<b>0</b>	<b>8,977</b>	<b>0</b>		

Summary Table 5. Summary Of Water Used By Hatcheries Operated By The Washington Department Of Fisheries Which Rear Anadromous Fish In The Columbia River Basin. Flow Is Listed in Gallons Per Minute (GPM) and Temperature is Listed in Degrees Fahrenheit.

Hatchery	Delivery	Average		High Flow		Low Flow		Highest Water		Lowest Water	
Water Source	Method	Flow	Temp.	Volume	Month	Volume	Month	Temp.	Month	Temp.	Month
Coulitz Salmon											
C-Wells	Pumped	1,000	49	1,000	Constant	1,000	Constant	52	September	43	Jan-March
Coulitz River	Pumped	67,000	47		Mar. - April		Oct. - Nov.	53	September	41	February
PW Wells	Pumped	800	49	800	Constant	800	Constant	52	September	43	Jan-March
Elokonin											
"A" Stream	Gravity	600	53	1,500	April	10	September	65	September	40	Jan. - Feb.
Clear Creek	Gravity	1,000	53	1,500	April	500	September	65	July-Aug.	40	Jan. - Feb.
Elokonin River	Gravity	4,000	51	4,200	April	3,800	September	65	July-Aug.	38	Jan. - Feb.
Elokonin River	Gravity	4,500	51	5,000	April	4,000	September	65	July-Aug.	38	Jan. - Feb.
Grays River											
Unnamed Stream		673		898	November	449	October				
W.F. Grays River	Gravity	4,488						68	July	32	February
Wells	Pumped	975	50	975	Constant	975	Constant	50	Constant	50	Constant
Kalama Falls											
Kalama River	Pumped	5,500	49	6,000	January	5,000	September	63	July	35	December
Unnamed Creek	Gravity	650		700	January	0	September				
Unnamed Creek	Gravity	500		500	January	0	September				
Klickitat											
Indian Ford Spring	Gravity	5,500	48	5,500		5,500		55	July	46	January
Indian Ford Spring	Gravity	2,600	48	2,600		2,600		55	July	46	January
Klickitat River	Gravity	8,000	48	9,000	April-May	7,000	Sept. - Oct.	55	July	32	February
Wonder Springs	Gravity	5,100	48	5,100		5,100		55	July	46	January
Lewis River											
Lewis River	Pumped	22,000	47	30,000	March-May	10,000	June	60	Oct. - Nov.	39	February
Lower Kalama											
Hatchery Creek	Gravity	4,000	48	8,000	Dec. - Jan.	0	July-Aug.	62	August	32	January
Kalama River	Pumped	6,000	48	6,000	December	5,000	July-Aug.	62	August	32	January
Lyons Ferry											
Wells	Pumped	29,930	52	29,930	Constant	29,930	Constant	54	July-Aug.	49	January

Summary Table 5. Continued

Hatchery		Delivery	Average		High Flow		Low Flow		Highest Water		Lowest Water	
Water	Source	Method	Flow	Temp.	Volume	Month	Volume	Month	Temp.	Month	Temp.	Month
Priest Rapids												
Columbia	River	Gravity	44,883	46					65	July-Sept.	34	January
Wells		Pumped	8,000	54					58	Nov. - Dec.	52	April - May
Ringold Salmon												
Ringold	Springs	Gravity	8,300	60	8,300	September	6,000	March	60	Constant	60	Constant
Rocky Reach												
Columbia	River	Pumped	12,000	53					68	September	38	February
Well		Pumped	1,800	50					62	September	38	February
Speelyai												
Speelyai	Creek	Gravity	6,732	49	8,079	Dec. - April	5,835	Summer	60	August	38	Jan. - Feb.
Toutle												
Green	River	Gravity	4,000	46	9,000							
Washougal												
Bobs	Creek	Gravity	800	46	900	October	800		50	August	38	February
Boyles	Creek	Gravity	1,200	47	3,600	Nov. - Dec.	400	August	58	July- Aug.	35	January
Washougal	River	Pumped	6,500	49	6,500	May-Sept.	1,000	Jan. - Feb.	73	August.	31	February
Wells Salmon												
Columbia	River	Gravity	34,111	53	78,545		8,977		68	September	34	Jan. - Feb.
Wells		Pumped	3,142	52	5,386	Jan. - March	449	Nov. - Dec.	53	October	52	March- April
Weyco Pond												
Alder	Creek	Gravity			8,977	Spring						

**Summary Table 6. Adult Return Information For Hatcheries Operated By The Washington Department Of Fisheries Rear Anadromous Fish In The Columbia River Basin. Adult Holding Inflow Is Given In Gallon Per Minute (GPM).**

Hatchery	Brood	Adult	Holding		Adult	Returns		# Femles	Adult	Adult
Species Stock	Year	Inflow	Period	Males	Femles	Jacks	Total	Spawned	Mrts.	Releases
<b>Coulitz Salmon</b>										
<b>Coho</b>										
Type N	1983	3,000	Aug. - Nov.	16,096	8,380	10,111	34,587	7,693		9,463
Type N	1984	3,000	Aug. - Nov.	17,178	8,944	4,752	30,874	7,609		6,427
Type N	1985	3,000	Aug. - Nov.	12,869	5,471	15,296	33,636	5,157		9,470
<b>Fall Chinook</b>										
Coulitz	1984	3,000	Aug. - Nov.	2,370	2,747	586	5,703	2,330		0
Cowlitz	1985	3,000	Aug. - Nov.	3,370	3,064	3,348	9,782	2,217		0
Cowlitz	1986	3,000	Aug. - Nov.	6,441	4,316	1,923	12,680	3,704		0
<b>Spring Chinook</b>										
Cowlitz	1983	3,000	April-Sept.	6,876	6,442	4,580	17,898	2,472		372
Cowlitz	1984	3,000	April-Sept.	6,360	6,690	1,261	14,311	1,821		0
Cowlitz	1985	3,000	April-Sept.	3,465	3,341	4,644	11,450	969		0
<b>Elokoni n</b>										
<b>Coho</b>										
Type N	1983	3,300	Oct. - Jan.	428	67	609	1,104	64		
Type N	1984	3,300	Oct. - Jan.	2,114	980	1,234	4,328	928		
Type N	1985	3,300	Oct. - Jan.	3,256	2,307	892	6,455	2,035		500
<b>Fall Chinook</b>										
Elokoni n	1984	3,300	Aug. - Oct.	936	772	6	1,714	448		
Elokoni n	1985	3,300	Aug. - Oct.	24	635	23	1,482	535		
Elokoni n	1986	3,300	Aug. - Oct.	805	709	139	1,653	585		
<b>Grays River</b>										
<b>Coho</b>										
Type S	1983	575	Oct. - Nov.	99	79	112	290	72		
Type S	1984	575	Oct. - Nov.	1,243	1,441	29	2,773	1,425		
Type S	1985	575	Oct. - Nov.	362	466	182	1,010	449		
<b>Fall Chinook</b>										
Grays River	1984	575	Sept. - Oct.	67	102	68	237	102		
Grays River	1985	575	Sept. - Oct.	148	78	131	357	67		
Grays River	1986	575	Sept. - Oct.	736	475	253	1,464	422		
<b>Kalama Falls</b>										
<b>Coho</b>										
Type N	1983	900	Nov. - Jan.	1,588	775	354	2,717	532		465
Type N	1984	900	Nov. - Jan.	757	555	316	1,628	30		1,425
Type N	1985	900	Nov. - Jan.	296	294	546	1,136	119		786
Type S	1983	900	Aug. - Nov.	579	461	112	1,152	461		184
Type S	1984	900	Aug. - Nov.	85	100	529	714	96		522
Type S	1985	900	Aug. - Nov.	296	144	185	625	107		270

Summary Table 6. Continued

Hatchery Species	Stock	Brood Year	Adult Inflow	Holding Period	Males	Adult Females	Returns Jacks	# Females Total Spawned	Adult Mrts.	Adult Releases
<b>Kalam Falls • Continued</b>										
<b>Fall Chinook</b>										
Kalam Falls		1984	900	Aug. - Oct.	1,788	2,106	13	3,907	1,935	106
Kalam Falls		1985	900	Aug. - Oct.	1,543	1,902	264	3,709	1,720	244
Kalam Falls		1986	900	Aug. - Oct.	2,109	1,563	173	3,845	1,426	291
Snake River		1984	900	Aug. - Nov.	121	99			66	
Snake River		1985	900	Aug. - Nov.	210	163	2	375	135	
Snake River		1986	900	Aug. - Oct.	132	170	0	302	114	
<b>Spring Chinook</b>										
Kalam Falls		1983	900	May-Sept.	912	443	246	2,001	266	1,399
Kalam Falls		1984	900	May-Sept.	368	435	4	807	250	176
Kalam Falls		1985	900	May-Sept.	47	49	11	107	45	
<b>Klickitat</b>										
<b>Fall Chinook</b>										
Klickitat		1984	2,000	Sept. - Oct.	91	46	9	146	40	
Klickitat		1985	2,000	Sept. - Oct.						
Klickitat		1986	2,000	Sept. - Oct.	173	29	45	247	27	
<b>Spring Chinook</b>										
Klickitat		1983	2,000	May-Sept.						
Klickitat		1984	2,000	May-Sept.	243	274	201	718	256	
Klickitat		1985	2,000	May-Sept.	34	19	161	214	16	
<b>Lewis River</b>										
<b>Coho</b>										
Type N		1983	4,000	Oct. - Dec.	9,067	4,343	5,878	19,288	4,227	46
Type N		1984	4,000	Oct. - Dec.	6,678	3,034	1,983	11,695	2,440	872
Type N		1985	4,000	Oct. - Dec.	7,000	2,236	13,623	22,859	1,955	615
Type S		1983	4,000	Sept. - Oct.	2,990	1,325	6,895	11,210	587	1,148
Type S		1984	4,000	Sept. - Oct.	1,955	437	43	2,835	723	130
Type S		1985	4,000	Sept. - Oct.	169	124	64	357	45	53
<b>Fall Chinook</b>										
Lewis River		1984	3,000		5	0	6	11	0	
Lewis River		1985	3,000		17	3	41	61	0	
Lewis River		1986			10	0	28	38	0	
<b>Lower Kalam</b>										
<b>Coho</b>										
Type N		1983	2,500	November	237	145	807	1,189	140	
Type N		1984	2,500	November	113	55	319	487		2
Type N		1985	2,500	November	72	51	85	208	32	38
Type S		1983	2,500	October	52	55	5	112	54	
Type S		1984	2,500	October	0	0	68	68	0	
Type S		1985	2,500	October	462	499	6	967	460	82

Summary Table 6. Continued

Hatchery	Species	Stock	Brood Year	Adult Inflow	Holding Period	Males	Adult Females	Returns Jacks	# Females Total Spawned	Adult Morts.	Adult Releases
Lower Kalama - Continued											
Fall Chinook											
	Kalama Falls		1984	2,500	Aug. - Oct.	642	705	31	1,378	668	
	Kalama Falls		1985	2,500	Aug. - Oct.	819	472	396	1,687	462	
	Kalama Falls		1986	2,500	Aug. - Oct.	1,740	755	169	2,664	735	
Lyons Ferry											
Fall Chinook											
	Lyons Ferry		1984	3,000							
	Lyons Ferry		1985	3,000	Sept. - Dec.	213	382	4,160	4,755	318	
	Lyons Ferry		1986	3,000	Sept. - Dec.	308	149	1,148	1,605	143	
Spring Chinook											
	Tucannon		1985	2,200	May-Sept.	a	14	0	22	5	
Priest Rapids											
Fall Chinook											
	Priest Rapids		1984	1,750	Sept. - Nov.	3,240	3,103	6,846	13,189	2,249	5,864
	Priest Rapids		1985	1,750	Sept. - Nov.	7,360	4,597	18,800	30,757	2,576	13,348
	Priest Rapids		1986	1,750	Sept. - Nov.	8,696	6,169	11,588	26,453	4,897	5,906
Spring Chinook											
			1984			385	514	1	900	0	
			1985			199	160	70	429	0	
Ringold Salmon											
Fall Chinook											
	Priest Rapids		1983	13,465	Sept. - Dec.	65	89	50	204	89	
Spring Chinook											
			1983	13,465	June - July	602	536	0	1,138	0	
			1985	13,465	June - July	0	0	570	570	0	
Speelyai											
Coho											
	Type S		1983	1,200	Sept. - Oct.	25	25	0	50	25	
	Type S		1984	1,200	Sept. - Oct.	1,528	1,004	64	2,596	820	
	Type S		1985	1,200	Sept. - Oct.	508	215	586	1,309	180	
Fall Chinook											
	Lewis River		1984	1,200		52	78	213	343	58	
	Lewis River		1985	1,200		220	196	323	739	167	
	Lewis River		1986	1,200		9	0	a	17	0	
Spring Chinook											
	Lewis River		1983	1,200	May-Sept.	40	63	1	104	48	
	Lewis River		1984	1,200	May-Sept.	201	250	1	452	222	
	Lewis River		1985	1,200	May-Sept.	176	232	30	438	218	



Summary Table 6. Continued

Hatchery Species	Stock	Brood Year	Adult Inflow	Holding Period	Males	Adult Females	Returns Jacks	# Females Total Spawned	Adult Morts.	Adult Releases
<b>Washougal</b>										
<b>Coho</b>										
Type N		1983	7,000	Nov. - Dec.	3,034	1,071	836	4,941	781	614
Type N		1984	7,000	Nov. - Dec.	4,814	1,561	1,065	7,440	1,247	4,032
Type N		1985	7,000	Nov. - Dec.	1,720	1,023	965	3,708	724	500
Type S		1983	7,000	October	2,723	1,760	440	4,923	1,673	454
Type S		1984	7,000	October	4,718	2,623	481	7,822	2,415	825
Type S		1985	7,000	October	2,554	1,935	1,434	5,923	1,594	956
<b>Fall Chinook</b>										
Washougal		1984	7,000	Sept. - Oct.	929	1,028	159	2,116	983	
Washougal		1985	7,000	Sept. - Oct.	1,365	914	5,425	7,704	888	2,750
Washougal		1986	7,000	Sept. - Oct.	2,221	1,775	62	4,058	1,598	150
<b>Wells</b>										
<b>Summer Chinook</b>										
Wells		1983	1,950	July- Oct.	418	423	1,009	1,850	393	907
Wells		1984	1,950	July- act.	499	595	225	1,319	543	
Wells		1985	1,950	July- Oct.	565	832	302	1,699	140	
Wells		1986	1,950	July- Oct.	785	1,116	318	2,219	952	

Summary Table 7. Total Egg Take And Fish Poned For Hatcheries Operated By The Washington Department Of Fisheries Which Rear Anadronous Fish In The Columbia River Basin.

Hatchery	Species	Stock	#Female Spawned	Spawning Begin	Date End	Release Year	Egg Take	Egg Transfers In	out	Fingerlings No.	Ponded Date	Transfer Of Fish In
<b>Cowlitz Salmon</b>												
<b>Coho</b>												
	Type N		7,693	11/16/83	01/31/84	1985	17,099,000		1,620,000	11,521,800	Feb-Apr	84
	Type N		7,609	11/13/84	02/06/85	1986	17,426,000		1,462,000	12,216,000	Jan-May	85
	Type N		5,157	11/25/85	02/04/86	1987	14,299,000		1,886,000	11,808,200	Feb-Mar	86
<b>Fall Chinook</b>												
	Cowlitz		2,330	09/25/84	11/13/84	1985	8,980,000		709,000	7,267,000	Dec-Mar	85
	Cowlitz		2,217	10/01/85	11/25/85	1986	9,979,000			8,805,600	Dec-Feb	86
	Cowlitr		3,704	09/30/86	12/03/86	1987	14,566,000			8,784,000	Jan-Feb	87
<b>Spring Chinook</b>												
	Cowlitz		2,472			1985	9,747,000			4,860,300	Nov.	1983
	Cowlitr		1,821	08/29/84	09/11/84	1986	7,490,000		22,000	4,059,000	Nov.	1984
	Cowlitz		969	08/20/85	10/01/85	1987	3,398,000			3,346,000	Oct-Dec	85
<b>Elokoni n</b>												
<b>Coho</b>												
	Type N		64	12/17/83	12/21/83	1985	200,000	2,875,000		2,340,000	March	1984
	Type N		928	11/15/84	12/08/84	1986	2,212,000			1,958,900	March	1985
	Type N		2,035	10/15/85	11/14/85	1987	5,272,500		2,372,000	2,221,000	Feb.	1986
	Type S					1986		757,600		592,000	Feb.	1986
<b>Fall Chinook</b>												
	Elokoni n		448	09/18/84	10/16/84	1985	1,875,300		170,000	1,621,700	Jan.	1985
	Elokomin		535	09/12/85	10/22/85	1986	2,592,000			2,233,000	Dec-Jan	86
	Elokoni n		585	09/16/86	11/04/86	1987	2,572,700			2,312,453	Dec-Feb	87
	Kalans Falls					1985		1,410,000		987,800	Feb.	1985
	Kalans Falls					1986		445,000		393,000	Jan-Feb	86
	Kalana Falls					1987		394,500		394,000	Feb.	1987
<b>Grays River</b>												
<b>Coho</b>												
	Type S		72	10/25/83	11/15/83	1985	126,000			83,000	Jan-Feb	84
	Type S		1,425	10/09/84	11/20/84	1986	3,705,000			3,296,000	Jan-Mar	85
	Type S		449	10/22/85	11/12/85	1987	1,218,000			1,096,658	Jan-Feb	86
<b>Fall Chinook</b>												
	Elokoni n			09/23/85	10/01/85	1986	855,000			703,200	Dec.	1985
	Grays River		102	09/24/84	11/17/84	1985	415,000			360,000	Jan-Feb	85
	Grays River		67	09/23/85	10/22/85	1986	327,000			257,400	Dec-Feb	86
	Grays River		422	09/17/86	11/05/86	1987	1,938,800			550,400	Jan-Mar	87
	Kalana Falls					1985		388,000		369,000		
	Kalana Falls					1986		1,206,800		1,147,400	Feb-Mar	86
	Washougal					1985					April	1985
	Washougal					1986					May	1986
	Washougal					1987		1,323,000		1,286,000	March	1987

Summary Table 7. Continued

Hatchery	Species	Stock	#Female spawned	Spawning Begin	Date End	Release Year	Egg Take	Egg In	Transfers out	Fingerlings No.	Ponded Date	Transfer Of Fish In
Weyco Pond												
Fall Chinook												
	Cowlitz					1986						144,000
	Kalama Falls					1986						1,184,000
Kalama Falls												
Coho												
	Type N		532	12/14/83	01/05/84	1985	1,287,500			551,800	April 1984	
	Type N		30	11/27/84	11/27/84	1986	86,200			74,000	April 1985	1,039,600
	Type N		119	11/19/85	12/12/85	1987	426,900	220,000		351,000	March 1986	500,000
	Type S		461	10/26/83	11/09/83	1985	974,900		269,200	560,000	Feb. 1984	
	Type S		96	1984 Brood Year								
	Type S		107	10/10/85	11/19/85	1986	459,000	534,500	66,000	823,000	Feb-Mar 86	228,000
Fall Chinook												
	Kalama Falls		1,935	09/17/84	11/05/84	1985	9,247,000		3,383,700	4,105,700	Feb. 1985	
	Kalama Falls		1,720	09/18/85	11/12/85	1986	8,488,200		2,453,600	4,500,000	Feb. 1986	
	Kalama Falls		1,426	09/16/86	11/04/86	1987	7,049,000		2,015,000	4,011,500	Dec-Feb 86	
	Snake River		66	1984 Brood								
	Snake River		135	1985 Brood								
	Snake River		114	1986 Brood					392,600			
Spring Chinook												
	Kalama Falls		266	09/07/83	09/21/83	1985	954,400			688,500	Dec. 1983	
	Kalama Falls		250	09/11/84	09/24/84	1986	1,123,800		204,500	645,000	Dec-Jan 85	
	Kalama Falls		45	08/30/85	09/26/85	1987	200,000			186,200	Jan. 1986	
Klickitat												
Coho												
	Type N					1986		1,522,500		1,439,500	Feb. 1985	
	Type N					1987		2,080,800		1,606,800	Jan-Mar 86	
	Type S					1985		1,615,000		1,565,000	Jan. 1984	
	Type S			10/15/86	11/04/86	1987	367,900			328,500	Jan. 1987	
Fall Chinook												
	Sig Creek					1986		4,203,800		4,023,100	Dec. 1985	
	Klickitat		40	09/26/84	10/24/84	1985	159,600			146,300	Dec-Jan 85	
	Klickitat		27	09/24/86	10/22/86	1987	117,900			98,300	Dec. 1986	
	Little White Sal					1986						362,000
	Wells					1987						1,216,300
Spring Chinook												
	Klickitat			08/16/83	09/13/83	1985	1,254,000			1,176,000	Nov-Dec 83	
	Klickitat		256	08/15/84	09/12/84	1986	1,073,000			962,500	Nov-Dec 84	
	Klickitat		16	08/19/85	09/09/85	1987	83,500			75,500	Nov. 1985	

Summary Table 7. Continued

Hatchery	#Female	Spawning	Date	Release	Egg	Egg	Transfers	Fingerlings	Ponded	Transfer	Of
Species	Stock	spawned	Begin	End	Year	Take	In	out	No.	Date	Fish In
Lewis River											
Coho											
Type N	4,227	11/29/83	01/03/84	1985	9,543,500			4,498,200	4,626,000	April 1984	
Type N	2,440	11/27/84	12/27/84	1986	6,362,500				5,587,000	April 1985	
Type N	1,955	11/20/85	12/26/85	1987	6,070,500				5,759,000	Mar-Apr 86	
Type S	587	10/18/83	11/21/83	1985	1,182,400			736,000			
Type S	723	11/05/84	11/19/84	1986	1,893,300			1,205,600	554,000		
Type S	85	11/08/85	11/14/85	1987	263,000			216,000			
Fall Chinook											
Lewis River				1985						June 1985	171,700
Lewis River				1986			477,000	431,500		May 1986	357,200
Spring Chinook											
Cowlitz				1985						Dec-Apr '84	960,100
Kalama River				1986						May 1985	361,300
Lewis River				1985							179,800
Lewis River				1986							438,000
Lewis River				1987							704,000
Lower Kalama											
Coho											
Type N	140	12/06/83	12/20/83	1985	222,000				142,000	April 1984	
Type N	2	11/26/84	11/26/84	1986	5,000			5,000			
Type N	32			1987							
Type S	54			1985							
Type S				1986							709,200
Type S	460	10/15/85	11/02/85	1987	1,373,000		71,000	762,000	565,000	Feb. 1986	
Fall Chinook											
Kalama Falls	668	09/25/84	10/22/84	1985	2,930,000	1,885,000			3,508,500	Jan-Mar 85	
Kalama Falls	462	09/24/85	10/29/85	1986	2,096,000	1,391,000			3,247,000	Jan-Mar 86	
Kalama Falls	735	09/24/86	10/22/86	1987	3,850,000				3,570,000	Jan-Feb 87	
Lyons Ferry											
Fall Chinook											
Lyons Ferry		11/08/84	12/05/84	1985	1,567,800				1,173,061	Feb. 1985	
Lyons Ferry	318	10/31/85	12/10/85	1986	1,414,300	1,182,200			2,377,604	Jan-Mar 86	
Lyons Ferry	143	10/22/86	12/16/86	1987	592,000	749,300			1,236,300	Jan-Feb 87	
Spring Chinook											
Tucannon	5	08/22/85	09/18/85	1987	14,000				13,300	Dec. 1985	
Priest Rapids											
Fall Chinook											
Priest Rapids	2,249	10/29/84	11/27/84	1985	10,493,000			1,000,000	5,270,000	Jan-Mar 85	
Priest Rapids	2,576	10/29/85	11/25/85	1986	10,623,000			2,578,000	6,608,800	Jan-Mar 86	
Priest Rapids	4,897	10/27/86	11/20/86	1987	22,126,100			15,176,500	7,389,800	Jan-Mar 87	

Summary Table 7. Continued

Hatchery	Species	Stock	#Female Spawned	Spawning Begin	Date End	Release Year	Egg Take	Egg Transfers In	out	Fingerlings No.	Ponded Date	Transfer Fish In	Of
Ringold Salmon													
Fall Chinook													
	Bonneville					1985					April 1984	2,136,400	
	Priest Rapids					1986					Feb-Mar 85	1,258,200	
	Priest Rapids					1987					Feb-Mar 86	1,306,100	
Rocky Reach													
Coho													
	Type N					1987		300,000		229,842	March 1986		
	Type S					1985		490,000		482,000	Jan. 1984		
	Type S					1986		550,000		540,000	Jan. 1985		
Fall Chinook													
	Priest Rapid X Snake					1985		800,985		749,885	Feb-Mar 84		
	Priest Rapid X Snake					1985		381,600		373,600	Feb-May 85		
	Priest Rapids					1987		250,000		243,500	May 1986		
	Wells ^					1987							572,413
Speelyai													
Coho													
	Type N					1985		811,200		792,000	March 1984		
	Type S	25	10/31/83	11/04/83		1985	39,000	736,000		457,400	Jan-Feb 84		
	Type S	820	10/16/84	11/20/84		1986	1,937,000	1,205,600		2,610,000	Jan-Feb 85		
	Type S	180	10/15/86	11/04/86		1987	367,900			328,500	Dec-Jan 86		
Fall Chinook													
	Lewis River	58				1985			182,000				
	Lewis River	167	10/10/85	11/26/85		1986	790,000			679,500	Jan-Mar 86		
Spring Chinook													
	Lewis River	48				1985							
	Lewis River	222	08/21/84	09/18/84		1986	855,000			821,000	Nov-Dec 84		
	Lewis River	218	08/22/85	09/20/85		1987	961,000			932,300	Nov-Dec 85		
Toutle													
Coho													
	Type S					1986							155,500
	Type S					1987							343,900
Fall Chinook													
	Kalama Falls					1987							458,000
	Washougal					1987							447,900
Washougal													
Coho													
	Type N	781	12/05/83	01/03/84		1985	1,551,500	500,000		1,971,000	Mar-Apr 84		
	Type N	1,247	12/03/84	12/26/84		1986	2,773,000			2,177,000	March 1985		
	Type N	724	11/25/85	12/26/85		1987	1,800,000	1,250,000		2,904,000	March 1986		

Summary Table 7. Continued

Hatchery Species	Stock	#Female Spawned	Spawning Date Begin End	Release Year	Egg Take	Egg Transfers In out	Fingerlings No.	Ponded Date	Transfer Of Fish In
<b>Washougal - Continued</b>									
<b>Coho - Continued</b>									
Type S		1,673	10/17/83	11108183	1985	3,554,000	2,201,000	1,117,000	Jan. 1984
Type S		2,415	10/14/84	11113184	1986	6,399,000	3,295,000	2,880,000	Jan. 1985
Type S		1,594	10/14/85	10/29/85	1987	4,391,000	2,653,000	2,620,000	Jan-Feb 86
<b>Fall Chinook</b>									
Abernathy				1986		1,828,000	1,592,000	Jan. 1985	
Cowlitz				1986		550,000	583,000	Jan. 1986	
Elokomin				1986					75,885
Grays River				1985					79,850
Kalama Falls				1985		1,929,000	1,928,000	Feb. 1985	
Washouga 1		983	09/30/84	11/12/84	1985	4,499,000	4,247,000	Jan-Mar 85	
Washouga 1		888	09130185	11/04/85	1986	4,138,800	3,939,000	Feb-Mar 86	
Washougal		1,598	09125186	11113186	1987	11,790,000	5,016,000	6,335,000	Jan-Feb 87
<b>Wells</b>									
<b>Summer Chinook</b>									
Wells		393	10/11/83	11114183	1985	1,975,000	1,528,600		
Wells		543	10/17/84	11/07/84	1985	2,379,400	1,907,700		
Wells		140	10116185	11/06/85	1986	3,585,000	2,340,512	Jan-Mar 86	
Wells		952	10/16/86	11112186	1987	4,555,020	3,610,152	Dec-Jan 87	

**Summary Table 8. Releases And Production Goals For Each Hatchery Operated By The Washington Department Of Fisheries Which Reared Anadromous Fish In The Columbia River Basin In 1985.**

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goal	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Cowlitz Salmon</b>											
Coho											
Type N		4,278,200	239,425	5,581,800	43,905			4,700,000	261,111	5,800,000	25,133
Fall Chinook											
Cowlitz		5,878,723	136,508					7,400,000	141,250		
Spring Chinook											
Cowlitz		627,100	87,263	2,984,800	76,155	85,000	264	650,000	92,857	2,500,000	50,000
TOTAL		10,784,023	463,196	8,566,600	120,060	85,000	264	12,750,000	495,218	8,300,000	75,133
<b>Elokomin</b>											
Coho											
Type N		1,703,000	92,454	1,205,300	2,108	670,000	1,341	1,700,000	106,250		
Fall Chinook											
Elokomin		1,582,000	16,653					2,500,000	25,000		
Kalama Falls		980,000	8,167								
TOTAL		4,265,000	117,274	1,205,300	2,108	670,000	1,341	4,200,000	131,250	0	0
<b>Grays River</b>											
Coho											
Type S		264,797	16,553	2,879,200	6,076			272,000	17,000	1,855,000	3,710
Fall Chinook											
Grays River		288,500	7,463			79,850	555				
Kalama Falls		365,900	4,190								
Washougal		187,700	2,536					200,000	2,222		
TOTAL		1,106,897	30,742	2,879,200	6,076	79,850	555	472,000	19,222	1,855,000	3,710
<b>Kalama Falls</b>											
Coho											
Type N		502,379	29,550	50,000	62			500,000	25,000		
Type S		328,400	20,524					270,000	16,875		
Fall Chinook											
Kalama Falls		3,646,800	42,915	354,500	1,781			3,000,000	30,000		
Spring Chinook											
Kalama Falls		624,300	45,992					550,000	55,000		
TOTAL		5,101,879	138,981	404,500	1,843	0	0	4,320,000	126,875	0	0

Summary Table 8. Continued

Hatchery	Species	Stock	Smolt	Releases	Fingerling	Releases	Transfers	Smolt	Production	Goal	Nonsmolt	Goal
			No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Klickitat</b>												
<b>Coho</b>												
		Type S	1,163,488	92,794	1,351,900	5,140	162,900	830	1,500,000	75,000		
<b>Fall Chinook</b>												
		Klickitat	123,100	2,003								
<b>Spring Chinook</b>												
		Klickitat	614,500	61,450	258,100	2,260			600,000	75,000	1,000,000	2,000
		<b>TOTAL</b>	1,901,088	156,247	1,610,000	7,400	162,900	830	2,100,000	150,000	1,000,000	2,000
<b>Lewis River</b>												
<b>Coho</b>												
		Type N	4,664,100	272,994	739,016	1,572			2,200,000	110,000		
		Type S	678,500	37,694	550,800	680			2,200,000	110,000		
<b>Fall Chinook</b>												
		Lewis River	164,400	82,200								
<b>Spring Chinook</b>												
		Cowlitz	882,800	107,890					800,000	53,333		
		Lewis River	164,700	20,110					170,000	11,333		
		<b>TOTAL</b>	6,554,500	520,888	1,289,816	2,252	0	0	5,370,000	284,666	0	0
<b>Lower Kalama</b>												
<b>Coho</b>												
		Type N	533,500	33,639	169,940	333			525,000	32,810		
<b>Fall Chinook</b>												
		Kalama Falls	2,468,800	28,451	976,410	5,425			3,500,000	35,000		
		<b>TOTAL</b>	3,002,300	62,090	1,146,350	5,758	0	0	4,025,000	67,810	0	0
<b>Lyons Ferry</b>												
<b>Fall Chinook</b>												
		Lyons Ferry	1,189,692	72,123					800,000	100,000		
		<b>TOTAL</b>	1,189,692	72,123	0	0	0	0	800,000	100,000	0	0
<b>Priest Rapids</b>												
<b>Fall Chinook</b>												
		Priest Rapids	6,988,800	112,988					7,500,000	107,140		
		<b>TOTAL</b>	6,988,800	112,988	0	0	0	0	7,500,000	107,140	0	0



Summary Table 8. Continued

Hatchery		Smolt	Releases	Fingerling	Releases	Transfers		Smolt Production		Goal	Nonsmolt	Goal
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	
Ringold Salmon												
Coho												
Type S						161,700	2,685					
Fall Chinook												
Bonneville		1,200,000	171,429					1,100,000	137,500			
Priest Rapids						3,219,600	5,854					
TOTAL		1,200,000	171,429	0	0	3,381,300	8,539	1,100,000	137,500	0	0	
Rocky Reach												
Coho												
Type S		388,790	29,678					400,000	20,000			
Fall Chinook												
Snake X Priest		349,300	26,048					250,000	31,250			
TOTAL		738,090	55,726	0	0	0	0	650,000	51,250	0	0	
Speelyai												
Coho												
Type M		151,300	8,405			421,000	12,689	150,000	7,500			
Type S				1,286,200	3,834	684,000	22,006			150,000	3,000	
Fall Chinook												
Kalama Falls						171,000	1,073					
Spring Chinook												
Kalama Falls						361,300	1,620					
Lewis River						438,700	3,800					
TOTAL		151,300	8,405	1,286,200	3,834	2,076,000	41,188	150,000	7,500	150,000	3,000	
Washougal												
Coho												
Type M		2,118,900	115,479	80,000	690			2,100,000	105,000			
Type S		1,064,760	59,423	1,477,700	3,636			1,000,000	50,000	1,500,000	3,000	
Fall Chinook												
Grays River		79,750	850					100,000	1,111			
Kalama Falls		1,896,500	20,175									
Washougal		4,060,500	53,059			200,000	303	6,000,000	70,296			
TOTAL		9,220,410	248,986	1,557,700	4,326	200,000	303	9,200,000	226,407	1,500,000	3,000	
Wells												
Summer Chinook												
Wells		1,735,000	38,314					1,690,000	62,630			
TOTAL		1,735,000	38,314	0	0	0	0	1,690,000	62,630	0	0	

**Summary Table 9. Releases And Production Goals For Each Hatchery Operated By The Uashington Department Of Fisheries Which Reared Anadromous Fish In The Columbia River Basin In 1986.**

Hatchery	Species	Stock	Smolt Releases No.	Lbs.	Fingerling Releases No.	Lbs.	Transfers No.	Lbs.	Smolt Production No.	Lbs.	Goal	Nonsmolt No.	Goal Lbs.
<b>Cowlitz Salmon</b>													
<b>Coho</b>													
	Type N		5,154,783	307,607	6,554,500	55,158			4,700,000	235,000		6,165,000	26,441
<b>Fall Chinook</b>													
	Cowlitr		8,545,000	192,354					7,400,000	125,000			
<b>Spring Chinook</b>													
	Cowlitz		665,453	87,568	2,332,800	58,073	196,000	330	600,000	60,000		2,000,000	25,000
<b>TOTAL</b>			14,365,236	587,529	8,887,300	113,231	196,000	330	12,700,000	420,000		8,165,000	51,441
<b>Elokoni n</b>													
<b>Coho</b>													
	Type N		1,700,000	106,250	141,200	347	500,132	2,192	1,700,000	106,250			
<b>Fall Chinook</b>													
	Elokoni n		2,265,273	33,455					2,650,000	28,000			
	Kalama Falls		237,600	3,086			150,000	259					
<b>TOTAL</b>			4,202,873	142,791	141,200	347	650,132	2,451	4,350,000	134,250		0	0
<b>Grays River</b>													
<b>Coho</b>													
	Type S		228,300	14,871	1,382,400	2,531	155,500	5,554	400,000	25,000		1,855,000	3,092
<b>Fall Chinook</b>													
	Elokoni n		666,700	11,434			75,885	730					
	Grays River		311,245	4,802					1,600,000	21,500			
	Kalama Falls		337,251	6,241			800,100	1,104					
	Washougal		72,795	735					100,000	1,000			
<b>TOTAL</b>			1,616,291	38,083	1,382,400	2,531	1,031,485	7,388	2,100,000	47,500		1,855,000	3,092
<b>Kalama Falls</b>													
<b>Coho</b>													
	Type N		1,036,300	77,458					900,000	47,370			
	Type S				917,200	1,407							
<b>Fall Chinook</b>													
	Kalama Falls		3,483,500	40,846	512,600	2,409	486,500	1,315	3,500,000	35,000			
<b>Spring Chinook</b>													
	Kalama Falls		404,000	28,857					500,000	50,000			
<b>TOTAL</b>			4,923,800	147,161	1,429,800	3,816	486,500	1,315	4,900,000	132,370		0	0

Summary Table 9. Continued

Hatchery	Smolt Releases	Fingerling Releases	Transfers	Smolt Production Goal	Non-smolt Goal
Species Stock	No. Lbs.	No. Lbs.	No. Lbs.	No. Lbs.	No. Lbs.
<b>Klickitat</b>					
Coho					
Type N	1,117,424 74,915			1,350,000 67,500	
Fall Chinook					
gig Creek	3,843,600 56,259			3,500,000 35,000	
Elokomin			256,400 302		
Grays River			67,900 75		
Little White Salmon	358,900 6,525			340,000 3,400	
Spring Chinook					
Klickitat	629,900 79,734			600,000 75,000	
<b>TOTAL</b>	<b>5,949,824 217,433</b>	<b>0 0</b>	<b>324,300 377</b>	<b>5,790,000 180,900</b>	<b>0 0</b>
<b>Lewis River</b>					
Coho					
Type N	4,403,900 250,800	1,464,100 3,953		4,440,000 222,000	
Type S	1,232,100 68,450				
Fall Chinook					
Lewis River	346,300 8,658			1,000,000 10,000	
Spring Chinook					
Kalama River	346,800 43,350				
Lewis River	419,600 52,450			800,000 80,000	
<b>TOTAL</b>	<b>6,748,700 423,708</b>	<b>1,464,100 3,953</b>	<b>0 0</b>	<b>6,240,000 312,000</b>	<b>0 0</b>
<b>Lower Kalama</b>					
Coho					
Type S	528,500 37,749			525,000 32,810	
Fall Chinook					
Kalama Falls	3,680,000 43,961			3,500,000 35,000	
<b>TOTAL</b>	<b>4,208,500 81,710</b>	<b>0 0</b>	<b>0 0</b>	<b>4,025,000 67,810</b>	<b>0 0</b>
<b>Lyons Ferry</b>					
Fall Chinook					
Lyons Ferry	2,320,835 84,981			2,800,000 85,500	
<b>TOTAL</b>	<b>2,320,835 84,981</b>	<b>0 0</b>	<b>0 0</b>	<b>2,800,000 85,500</b>	<b>0 0</b>
<b>Priest Rapids</b>					
Fall Chinook					
Priest Rapids	6,559,000 128,502		7,180 46	8,000,000 141,170	
<b>TOTAL</b>	<b>6,559,000 128,502</b>	<b>0 0</b>	<b>7,180 46</b>	<b>8,000,000 141,170</b>	<b>0 0</b>

Summary Table 9. Continued

Hatchery		Smolt	Releases	Fingerling	Releases	Transfers		Smolt	Production	Coal	Non-smolt	Coal
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	No.	Lbs.
Ringold Salmon												
Fall Chinook												
Elokoni						254,525	4,274					
Grays River						67,375	1,106					
Priest	Rapids	1,300,000	216,666					1,000,000	125,000			
TOTAL		1,300,000	216,666	0	0	321,900	5,380	1,000,000	125,000	0	0	
Rocky Reach												
Coho												
Type S		554,563	33,207					500,000	25,000			
Fall Chinook												
Snake X Priest		252,268	22,129					200,000	25,000			
TOTAL		806,831	55,336	0	0	0	0	700,000	50,000	0	0	
Speelyai												
Coho												
Type S		151,200	10,800	425,900	2,945	1,236,900	32,550					
Fall Chinook												
Kalama Falls				356,640	743	357,200	1,520					
Spring Chinook												
Lewis River		280,680	22,220			707,000	9,410	250,000	25,000			
TOTAL		431,880	33,020	782,540	3,688	2,301,100	43,480	250,000	25,000	0	0	
Toutle												
Coho												
Type S		155,250	9,703					150,000	7,500			
TOTAL		155,250	9,703	0	0	0	0	150,000	7,500	0	0	
Uashougal												
Coho												
Type N		1,951,300	103,688	514,700	1,127			2,000,000	100,000	676,000	1,130	
Type S		1,075,300	56,130	349,100	2,192	1,029,000	1,670	1,000,000	50,000			
Fall Chinook												
Abernathy		1,651,100	18,552									
Coulitr		568,900	6,392									
Elokoni		75,600	849									
Uashougal		3,867,400	53,167			76,000	439	6,000,000	70,296			
TOTAL		9,189,600	238,778	863,800	3,319	1,105,000	2,109	9,000,000	220,296	676,000	1,130	

Summary Table 9. Continued

Hatchery		Smolt	Releases	Fingerling	Releases	Transfers		Smolt	Production	Goal	Nonsmolt	Goal
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.		No.	Lbs.
<hr/>												
Wells												
Summer Chinook												
	Wells	1,992,057	45,411					1,690,000	62,630			
.....												
	TOTAL	1,992,057	45,411	0	0	0	0	1,690,000	62,630		0	0
Ueyco Pond												
Fall Chinook												
	Cowlitz	144,000	1,440					1,000,000	10,000			
	Kalam Falls	1,184,000	11,840					1,000,000	10,000			
.....												
	TOTAL	1,328,000	13,280	0	0	0	0	2,000,000	20,000		0	0

**Summary Table 10. Releases And Production Goals For Each Hatchery Operated By The Uashington Department Of Fisheries Which Reared Anadromous Fish In The Columbia River Basin In 1987.**

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Non-smolt Goal	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Cowlitz Salmon</b>											
<b>Coho</b>											
Type N		4,758,000	265,123	5,852,920	47,994			4,700,000	235,000	6,165,000	26,441
<b>Fall Chinook</b>											
Cowlitz		9,072,000	177,866					7,400,000	125,000		
<b>Spring Chinook</b>											
Cowlitz		633,359	83,699	2,563,600	51,234			600,000	60,000	2,500,000	31,250
<b>TOTAL</b>		14,463,359	526,688	8,416,520	99,228	0	0	12,700,000	420,000	8,665,000	57,691
<b>Elokoni</b>											
<b>Coho</b>											
Type N		1,338,197	89,739	1,350,000	2,825	531,500	2,300	1,700,000	106,250	1,149,000	1,915
<b>Fall Chinook</b>											
Elokoni		2,584,800	37,170					2,930,000			
Kalama Falls		390,500	5,821								
<b>TOTAL</b>		4,313,497	132,730	1,350,000	2,825	531,500	2,300	4,630,000	106,250	1,149,000	1,915
<b>Grays River</b>											
<b>Coho</b>											
Type S		430,400	29,205	1,451,300	2,757	258,900	6,242	400,000	25,000	1,855,000	3,092
<b>Fall Chinook</b>											
Grays River		640,400	16,055								
Uashougal		830,200	9,772			447,900	974				
<b>TOTAL</b>		1,901,000	55,032	1,451,300	2,757	706,800	7,216	400,000	25,000	1,855,000	3,092
<b>Kalama Falls</b>											
<b>Coho</b>											
Type N		950,300	65,616	223,600	402	137,500	3,274	900,000	56,250		
<b>Fall Chinook</b>											
Kalama Falls		3,548,400	50,548			420,000	1,184	4,400,000	44,000		
<b>Spring Chinook</b>											
Kalama Falls		176,000	23,467					150,000	15,000		
<b>TOTAL</b>		4,674,700	139,631	223,600	402	557,500	4,458	5,450,000	115,250	0	0
<b>Klickitat</b>											
<b>Coho</b>											
Type N		1,383,551	85,290					1,350,000	67,500		
Type S				194,500	340	130,000	227				

Summary Table 10. Continued

Hatchery		Smolt	Releases	Fingerling	Releases	Transfers		Smolt	Production	Goal	Nonsmolt	Goal
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.		No.	Lbs.
<b>Klickitat - Continued</b>												
Fall Chinook												
Klickitat		99,200	1,503									
Priest Rapids		3,502,300	50,586									
Wells		1,203,600	17,595									
Spring Chinook												
Klickitat		59,300	6,051					65,000	8,125			
-----												
TOTAL		6,247,951	161,025	194,500	340	130,000	227	1,415,000	75,625		0	0
<b>Lewis River</b>												
Coho												
Type N		4,376,900	258,880	2,179,000	2,620			5,460,000				
Type S		968,959	55,042									
Spring Chinook												
Lewis River		667,600	62,120									
-----												
TOTAL		6,013,459	376,042	2,179,000	2,620	0	0	5,460,000	0		0	0
<b>Lower Kalama</b>												
Coho												
Type N						134,400	3,200					
Type S		556,000	35,190					525,000	32,810			
Fall Chinook												
Kalama Falls		3,520,500	53,429			458,000	1,251	3,500,000	35,000			
-----												
TOTAL		4,076,500	88,619	0	0	592,400	4,451	4,025,000	67,810		0	0
<b>Lyons Ferry</b>												
Fall Chinook												
Lyons Ferry		1,060,971	67,250					500,000	62,500			
Spring Chinook												
Tucannon		12,922	2,172					20,000	2,000			
-----												
TOTAL		1,073,893	69,422	0	0	0	0	520,000	64,500		0	0
<b>Priest Rapids</b>												
Fall Chinook												
Priest Rapids		6,048,000	112,361			1,041,286	10,587	8,000,000	119,640			
-----												
TOTAL		6,048,000	112,361	0	0	1,041,286	10,587	8,000,000	119,640		0	0

Summary Table 10. Continued

Hatchery		Smolt	Releases	Fingerling	Releases	Transfers	Smolt	Production	Goal	Nonsmolt	Goal
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
Ringold Salmon											
Coho											
Type S						112,860	3,953				
Fall Chinook											
Priest	Rapids	1,100,000	183,333					1,100,000	137,500		
TOTAL		1,100,000	183,333	0	0	112,860	3,953	1,100,000	137,500	0	0
Rocky Reach											
Coho											
Type N		473,121	36,963					500,000	25,000		
Type S						10,000	250				
Fall Chinook											
Priest	Rapids	237,467	27,937					200,000	25,000		
	Wells	247,500	1,768								
TOTAL		958,088	66,668	0	0	10,000	250	700,000	50,000	0	0
Speelyai											
Coho											
Type S		150,150	15,015	229,800	2,649	971,250	38,195	150,000	7,500		
Spring Chinook											
Lewis	River	234,090	30,780			580,500	6,450				
TOTAL		384,240	45,795	229,800	2,649	1,551,750	54,645	150,000	7,500	0	0
Toutle											
Coho											
Type S		333,350	16,668					150,000	7,500		
Fall Chinook											
Kalam	Falls	456,100	6,516								
Uashouga	l	446,300	6,376								
TOTAL		1,235,750	29,560	0	0	0	0	150,000	7,500	0	0
Uashougal											
Coho											
Type N		2,108,526	106,371	223,250	923	102,000	2,000	2,000,000	100,000		
Type S		952,954	47,647	65,200	108	1,328,800	7,900	1,000,000	50,000		
Fall Chinook											
Uashougal		6,207,000	78,676					6,000,000	69,414		
TOTAL		9,268,480	232,694	288,450	1,031	1,430,800	9,900	9,000,000	219,414	0	0



Summary Table 10. Continued

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goal	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
Wells											
Fall Chinook											
Wells				298,372	1,130	1,788,731	4,289				
Summer Chinook											
Wells		1,413,069	63,941					1,690,000	62,630		
.....											
TOTAL		1,413,069	63,941	298,372	1,130	1,788,731	4,289	1,690,000	62,630	0	0

**Summary Table 11. Production In Pounds Outing The Three Year Period 1985-1987 For Hatcheries Operated By The Uashington Department Of Fisheries Which Reared Anadronous Fish In The Columbia River Basin. Smolts Include Pounds Of Smolts Released, Fingering Includes Pounds Of Non-smolting Fish Released, And Trans. Includes The Pounds Of Fish Transferred to Other Rearing Facilities.**

Hatchery		1985			1986			1987			3 Year
Species	Stock	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Average
Cowlitz	Salmon										
	Coho										
	Type N	239,425	43,905		307,607	55,158		265,123	47,994		
	Fall Chinook										
	Cowlitz	136,508			192,354			177,866			
	Spring Chinook										
	Cowlitz	87,263	76,155	264	87,568	58,073	330	83,699	51,234		
		463,196	120,060	264	587,529	113,231	330	526,688	99,228	0	636,842
Elokomin											
	Coho										
	Type N	92,454	2,108	1,341	106,250	347	2,192	89,739	2,825	2,300	
	Fall Chinook										
	Elokomin	16,653			33,455			37,170			
	Kalana Falls	8,167			3,086		259	5,821			
		117,274	2,108	1,341	142,791	347	2,451	132,730	2,825	2,300	134,722
Grays River											
	Coho										
	Type S	16,553	6,076		14,871	2,531	5,554	29,205	2,757	6,242	
	Fall Chinook										
	Elokomin				11,434		730				
	Grays River	7,463		555	4,802			16,055			
	Kalana Falls	4,190			6,241		1,104				
	Washougal	2,536			735			9,772		974	
		30,742	6,076	555	38,083	2,531	7,388	55,032	2,757	7,216	50,127
Kalana Falls											
	Coho										
	Type N	29,550	62		77,458			65,616	402	3,274	
	Type S	20,524				1,407					
	Fall Chinook										
	Kalana Falls	42,915	1,781		40,846	2,409	1,315	50,548		1,184	
	Spring Chinook										
	Kalana Falls	45,992			28,857			23,467			
		138,981	1,843	0	147,161	3,816	1,315	139,631	402	4,458	145,869

Summary Table 11. Continued

Hatchery		1985			1986			1987			3 Year
Species	Stock	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Average
Klickitat											
Coho											
Type N					74,915			85,290			
Type S		92,794	5,140	830					340	227	
Fall Chinook											
gig Creek					56,259						
Elokoni n							302				
Grays River							75				
Klickitat		2,003						1,503			
Little White Salmon					6,525						
Priest Rapids								50,586			
Wells								17,595			
Spring Chinook											
Klickitat		61,450	2,260		79,734			6,051			
-----											
		156,247	7,400	830	217,433	0	377	161,025	340	227	181,293
Lewis River											
Coho											
Type N		272,994	1,572		250,800	3,953		258,880	2,620		
Type S		37,694	680		68,450			55,042			
Fall Chinook											
Lewis River		82,200			8,658						
Spring Chinook											
Cowlitz		107,890									
Kalama River					43,350						
Lewis River		20,110			52,450			62,120			
-----											
		520,888	2,252	0	423,708	3,953	0	376,042	2,620	0	443,154
Lower Kalama											
Coho											
Type N		33,639	333							3,200	
Type S					37,749			35,190			
Fall Chinook											
Kalama Falls		28,451	5,425		43,961			53,429		1,251	
-----											
		62,090	5,758	0	81,710	0	0	88,619	0	4,451	80,876
Lyons Ferry											
Fall Chinook											
Lyons Ferry		72,123			84,981			67,250			
Spring Chinook											
Tucannon								2,172			
-----											
		72,123	0	0	84,981	0	0	69,422	0	0	75,509

Summary Table 11. Continued

Hatchery		1985			1986			1987			3 Year
Species	Stock	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Average
<b>Priest Rapids</b>											
<b>Fall Chinook</b>											
Priest Rapids		112,988			128,502		46	112,361		10,587	
		.....			.....			.....			.....
		112,988	0	0	128,502	0	46	112,361	0	10,587	121,495
<b>Ringold Salmon</b>											
<b>Coho</b>											
Type S				2,685						3,953	
<b>Fall Chinook</b>											
Bonneville		171,429									
Elokonin						4,274					
Grays River						1,106					
Priest Rapids				5,854	216,666			183,333			
		.....			.....			.....			.....
		171,429	0	8,539	216,666	0	5,380	183,333	0	3,953	196,433
<b>Rocky Reach</b>											
<b>Coho</b>											
Type N								36,963			
Type S		29,678			33,207					250	
<b>Fall Chinook</b>											
Priest Rapids								27,937			
Snake X Priest		26,048			22,129						
Wells								1,768			
		.....			.....			.....			.....
		55,726	0	0	55,336	0	0	66,668	0	250	59,327
<b>Speelyai</b>											
<b>Coho</b>											
Type N		8,405		12,689							
Type S			3,834	22,006	10,800	2,945	32,550	15,015	2,649	38,195	
<b>Fall Chinook</b>											
Kalama Falls				1,073		743	1,520				
<b>Spring Chinook</b>											
Kalama Falls				1,620							
Lewis River				3,800	22,220		9,410	30,780		6,450	
		.....			.....			.....			.....
		8,405	3,834	41,188	33,020	3,688	43,480	45,795	2,649	44,645	75,568

Summary Table 11. Continued

Hatchery		1985			1986			1987			3 Year
Species	Stock	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Average
Toutle											
Coho											
Type S					9,703			16,668			
Fall Chinook											
Kalama Falls								6,516			
Uashougal								6,376			
		0	0	0	9,703	0	0	29,560	0	0	13,088
Uashougal											
Coho											
Type N		115,479	690		103,688	1,127		106,371	923	2,000	
Type S		59,423	3,636		56,130	2,192	1,670	47,647	108	7,900	
Fall Chinook											
Abernathy					18,552						
Cowlitz					6,392						
Elokomin					849						
Grays River		850									
Kalama Falls		20,175									
Uashougal		53,059		303	53,167		439	78,676			
		248,986	4,326	303	238,778	3,319	2,109	232,694	1,031	9,900	247,149
Wells											
Fall Chinook											
Wells								1,130	4,289		
Summer Chinook											
Uells		38,314			45,411			63,941			
		38,314	0	0	45,411	0	0	63,941	1,130	4,289	51,028
Weyco Pond											
Fall Chinook											
Cowlitz					1,440						
Kalama Falls					11,840						
		0	0	0	13,280	0	0	0	0	0	4,427

**Summary Table 12. Total Anadromous Fish Production In Pounds (Includes Smolt And Fingerling Releases And Transfers), Theoretical Production In Pounds Calculated For Flow And Density Methods, And 1987 Agency Production Goals (Smolts Plus Fingerlings) For Hatcheries Operated By The Uashington Department Of Fisheries In The Columbia River Basin.**

Hatchery	Total Hatchery Production in Pounds				Theoretical Productions in Lbs		1987 Agency Goal in Lbs
	1985	1986	1987	Average	Flow Method	Density Method	
Cowlitz Salmon	583,520	701,090	625,916	636,842	658,864	686,430	477,691
Elokomin	120,723	145,589	137,855	134,722	127,239	383,069	108,165
Grays River	37,373	48,002	65,005	50,127	42,300	51,053	49,592 *
Kalama Falls	140,824	152,292	144,491	145,869	118,324	239,770	115,250
Klickitat	164,477	217,810	161,592	181,293	177,081	338,330	201,600 *
Lewis River	523,140	427,661	378,662	443,154	421,998	695,508	304,800 *
Lower Kalama	67,848	81,710	93,070	80,876	109,791	314,190	67,810
Lyons Ferry	72,123	84,981	69,422	75,509	285,801	303,190	64,500
Priest Rapids	112,988	128,548	122,948	121,495	172,480	171,281	119,640
Ringold Salmon	179,968	222,046	187,286	196,433	79,231	652,747	137,500
Rocky Reach	55,726	55,336	66,918	59,327	A, 486	128,695	50,000
Speelyai	53,427	80,188	93,089	75,568	68,904	191,678	66,500 •
Toutle	0	9,703	29,560	13,088	146,853	529,200	78,400 •
Uashougal	253,615	244,206	243,625	247,149	128,190	246,899	219,414
Wells	38,314	45,411	69,360	51,028	99,801	127,566	62,630
Weyco Pond	0	13,280	0	4,427	43,646	95,971	10,000 *
<b>TOTAL</b>	<b>2,404,066</b>	<b>2,657,853</b>	<b>2,488,799</b>	<b>2,516,906</b>	<b>2,753,989</b>	<b>5,155,577</b>	<b>2,133,492</b>

\* The 1987 production goal was not provided or was incomplete. Numbers provided are the current agency goals except for Grays River Hatchery and Weyco Pond which use the 1986 production goal.

**Summary Table 13. Anadromous Species Which Can Be Reared at Individual Hatcheries Operated By The Washington Department Of Fisheries In The Columbia River Basin. An "O" Indicates Species Currently Being Reared And A "X" Designates Species Which Potentially Could Be Reared.**

Hatchery	Fall	Spring	Summer	Searun				
	Chinook	Chinook	Chinook	Coho	Steelhead	Cutthroat	Sockeye	Chum
Cowlitz Salmon	0	0	X	0	X	X	X	X
Elokomin	0			0	X	X	X	X
Grays River	0			0	X	X	X	X
Kalama Falls	0	0	X	0	X	X	X	X
Klickitat	0	0	X	0	X	X		X
Lewis River	0	0	X	0	X	X		X
Lower Kalama	0	0	X	0	X	X		X
Lyons Ferry	0	0	X	X	X		X	
Priest Rapids	0						X	
Ringold Salmon	X	0	X	X	X			
Rocky Reach	X			0	X			X
Speelyai	0	0	X	0	X	X		X
Tout le	0			0	X	X		X
Washougal	0			0	X	X		X
Wells Salmon	0	X	0	X	X		X	
Ueyco Pond	0			X	X			

APPENDIX A  
ADDRESSES AND PHONE NUMBERS  
OF AGENCIES OPERATING ANADROMOUS FISH HATCHERIES



Appendix A. Addresses And Phone Numbers Of Agencies Which Operate  
Anadromous Fish Hatcheries In The Columbia River Basin.

Idaho Department Of Fish and Game (206) 334-3791  
PO Box 25  
Boise, Idaho 93707

Oregon Department Of Fish And Wildlife (503) 229-5400  
PO Box 59  
Portland, Oregon 97207

U.S. Fish And Wildlife Service (503) 231-6119  
911 NE 11th Ave.  
Portland, Oregon 97232-4181

Washington Department Of Fisheries (206) 234-6600  
115 General Admin. Building  
Olympia, Washington 98501

Washington Department Of Wildlife (206) 753-5710  
600 N. Capital Way  
Olympia, Washington 98504

APPENDIX B  
DATA COLLECTION FORMS

## HATCHERY SUMMARY

Hatchery Name: \_\_\_\_\_ Hatchery Code: \_\_\_\_\_

Operating Agency: \_\_\_\_\_

Funding Agency/Agencies: \_\_\_\_\_

Initial Year of Operation: \_\_\_\_\_ Current Date: \_\_\_\_\_

Address: \_\_\_\_\_ Phone Number: \_\_\_\_\_

\_\_\_\_\_ Hatchery Manager: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Facility and Operating Synopsis (Use continuation sheet if necessary):

## SITE DATA

Hatchery Name: \_\_\_\_\_ Hatchery Code: \_\_\_\_\_

### Location of Hatchery/:

Basin Subregion: \_\_\_\_\_

River: \_\_\_\_\_

Tributary System to Mainstream: \_\_\_\_\_

Elevation of Hatchery in Feet: \_\_\_\_\_

Nearest Town: \_\_\_\_\_

### Legal Covenants and Conditions:

Land Owner: \_\_\_\_\_

Land Area: \_\_\_\_\_

Percent in use: \_\_\_\_\_

Terms of Lease (if any): \_\_\_\_\_

Easements / Rights of Way (if any): \_\_\_\_\_

Special Operation or Construction Permits: \_\_\_\_\_

Pollution Control Requirements / Permits: \_\_\_\_\_

### Water Rights:

	Permit/ Certificate Number	Source	Purpose of Use	Priority Date	Amount
1	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____
5.	_____	_____	_____	_____	_____

NOTE: Provide the above information for each Satellite location on a separate form and attach to corresponding hatchery. Include a brief description of each satellite's function in relation to the parent hatchery.

# WATER SUPPLY SUMMARY

Hatchery: \_\_\_\_\_ Location Code: \_\_\_\_\_

	Source #1	Source #2	Source #3
	-----	-----	-----
Delivery (P/G)*	_____	_____	_____
Use	_____	_____	_____
Average Flow	_____	_____	_____
Average Temp.	_____	_____	_____
High Flow/Month	_____	_____	_____
Low Flow/Month	_____	_____	_____
High Temp./Month	_____	_____	_____
Low Temp./Month	_____	_____	_____

\* Pumped or gravity

Comments :

Reuse System (Description):

NOTE: Attach a separate form for each satellite location.

# FACILITY INVENTORY

Hatchery: \_\_\_\_\_

Hatchery Code: \_\_\_\_\_

	Type/ Dimensions	Usable Volume	Number	Age	Material	Condition	Comments
<b><u>COMPONENT 1/:</u></b>							
<b>Incubation:</b>	_____		_____	_____	_____		_____
	_____		_____	_____	_____		_____
	_____		_____	_____	_____		_____
	_____		_____	_____	_____		_____
<b>Start Tanks:</b>	_____	_____	_____	_____	_____		_____
	_____	_____	_____	_____	_____		_____
	_____	_____	_____	_____	_____		_____
	_____	_____	_____	_____	_____		_____
<b>Raceways:</b>	_____	_____	_____	_____	_____		_____
	_____	_____	_____	_____	_____		_____
	_____	_____	_____	_____	_____		_____
	_____	_____	_____	_____	_____		_____
<b>ponds:</b>	_____	_____	_____	_____	_____		_____
	_____	_____	_____	_____	_____		_____
	_____	_____	_____	_____	_____		_____
	_____	_____	_____	_____	_____		_____

1/Correct for irregular shapes.

**LAYOUT:** Attach a layout drawing of the hatchery showing major features such as buildings, raceways, ponds, etc.

## STAFFING SUMMARY

Hatchery: \_\_\_\_\_

Hatchery Code: \_\_\_\_\_

(Description of normal facility staffing practices. Include breakdown of full time, part time, and temporary staff by type of position/title.)

## ADULT CAPTURING/HANDLING

Hatchery: \_\_\_\_\_

Hatchery Code: \_\_\_\_\_

Species: \_\_\_\_\_

### Spawning:

Method of Adult Return to Site:

Adult Holding Pond:

Ladder:

Flow:

Off-site capture:

Volume:

Other:

Holding Density:

Method of Adult Holding:

Description of holding ponds:

Method of separating males and females:

Method of holding/handling with mixed species/stock returns:

Typical time of adult holding:

Spawning procedure:

Method of fertilization:

### Hatchery Return Information

	# Returned	# Spawned	# Released *	# Other
Males	_____	_____	_____	_____
Females	_____	_____	_____	_____
Jacks	_____	_____	_____	_____
Total	_____	_____	_____	_____

\*Note : Describe release strategy/goal:



## HATCHERY PRODUCTION

Hatchery \_\_\_\_\_  
Species: \_\_\_\_\_  
Stock: \_\_\_\_\_  
Year: \_\_\_\_\_

Hatchery Code: \_\_\_\_\_

A. Hatchery Production Goal:

# Pre-Smolts:	_____	Size:	_____
# Smolts:	_____	Size:	_____

### B. Production Summary:

	Number	Starting Date	Ending Date
Egg Take:			
Egg Density:			
Incubation Method:			
Eyed Egg Count			
Fingerling Ponded:			
Density			

C. Number of Fish Released:

Number	Pounds	Fish/Lbs	Dates	# Tagged Released
--------	--------	----------	-------	----------------------

On Site: \_\_\_\_\_

[illegible]

# HATCHERY PRODUCTION SUMMARY FOR FISCAL YEARS 1985 TO 1987

Hatchery Name: \_\_\_\_\_ Hatchery Code: \_\_\_\_\_

Fiscal Year: \_\_\_\_\_

## A. Total Releases For Hatchery By Species:

Species	Stock	# of Fish	Lbs of Fish
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Total For The Year (All Species) \_\_\_\_\_

## B. Total Interim Production For Hatchery By Species:

(Fish reared for a period of time and transferred to other stations, increase in pounds during the period fish were on station)

Species	Stock	# of Fish	Lbs of Fish
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Total For The Year (All Species) \_\_\_\_\_

HATCHERY PRODUCTION SUMMARY  
FOR FISCAL YEARS 1985 TO 1987

Hatchery Name: \_\_\_\_\_ Hatchery Code: \_\_\_\_\_

Fiscal Year: \_\_\_\_\_

C. Total Production For Hatchery By Species:  
(Part "A" plus part "B")

Species	Stock	# of Fish	Lbs of Fish
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Total For The Year (All Species)		_____	_____

D. Total Operating Cost For Hatchery  
cost: \_\_\_\_\_

## PRODUCTION CONSTRAINTS

Hatchery: \_\_\_\_\_

Hatchery Code: \_\_\_\_\_

Describe Current Restraints to Production relating to:

Physical Hatchery Layout:

Water Sources/Supplies/Delivery System/Quality/Water Rights:

Adult Holding/Spawning Capabilities:

Egg Related Constraints:

Fish Rearing Constraints:

Administrative Constraints (ie. mixed species hatchery):

HATCHERY PRODUCTION SMOLT CAPACITY

Hatchery Name: \_\_\_\_\_ Hatchery Code: \_\_\_\_\_

Species	Actual Hatchery Production		Smolt Production Goal	
	Number	Pounds	Number	Pounds
-----				
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Theoretical Production:  
Piper's 1982 Flow Method:

Piper's 1982 Density Method:

## HATCHERY EXPANSION CAPABILITY

Hatchery Name: \_\_\_\_\_

Hatchery Code: \_\_\_\_\_

Land:

Describe Land Available:

Land Ownership:

Water:

Quantity:

Amount Available (Actual or Potential):

Type: Ground: \_\_\_\_\_ Surface: \_\_\_\_\_

Description/Method of Acquisition:

Quality:

Temperature Range:

Possible Chemical Limitations:

Potential Disease Problems:

Feasibility:

Distance from Hatchery:

Availability of Water Right:

Type Delivery: Pump: \_\_\_\_\_ Gravity: \_\_\_\_\_

Type of Construction:

Estimate of Cost (use conceptual design information):

Description

cost

Land Acquisition:

Construction:

Water Related:

O&M:

Potential Smolt Production: